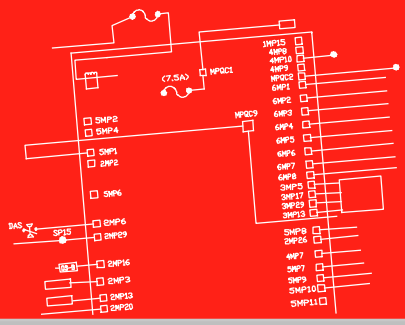
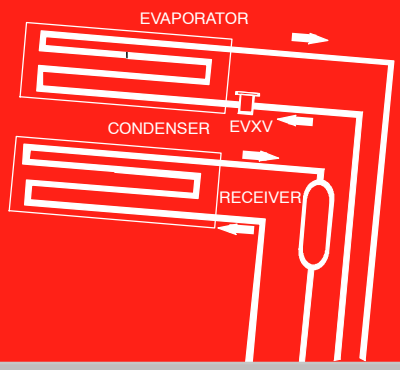
Carrier® Trailer & Rail Refrigeration







OPERATION & SERVICE MANUAL

for

VECTOR 6500

Single–Temp Trailer and Rail Refrigeration Units

With Advance™ Microprocessor

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Carrier

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SECTION 1 – SAFETY PRECAUTIONS

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SECTION 1

SAFETY PRECAUTIONS

1.1 SAFETY PRECAUTIONS

Your Carrier Transicold refrigeration unit has been designed with the safety of the operator in mind. During normal operation, all moving parts are fully enclosed to help prevent injury. During all pre-trip inspections, daily inspections, and problem troubleshooting, you may be exposed to moving parts. Please stay clear of all moving parts when the unit is in operation and when the Main Power Switch is not in the OFF position.

⚠ CAUTION

Under no circumstances should a technician electrically probe the microprocessor at any point, other than the connector terminals where the harness attaches. Microprocessor components operate at different voltage levels and at extremely low current levels. Improper use of voltmeters, jumper wires, continuity testers, etc. could permanently damage the microprocessor.

⚠ CAUTION

Most electronic components are susceptible to damage caused by electrical static discharge (ESD). In certain cases, the human body can have enough static electricity to cause resultant damage to the components by touch. This is especially true of the integrated circuits found on the microprocessor.

Automatic Start-Stop

Your refrigeration unit is equipped with auto-start in both Start-Stop and Continuous Operation. The unit may start at any time the Main Power Switch is not in the OFF position. A buzzer will sound for 5 seconds before the unit is started. When performing any check of the refrigeration unit (e.g., checking the belt, checking the oil), make certain that the Main Power Switch is in the OFF position.

Engine Coolant

The engine is equipped with a pressurized cooling system including a pressurized coolant bottle. Under normal operating conditions, the coolant in the engine and radiator is under high pressure and is very hot. Contact with hot coolant can cause severe burns. Do not remove the cap from a hot radiator or bottle. If the cap must be removed, cover it with a rag and remove very slowly in order to release the pressure without spray.

Refrigerants

The refrigerant contained in the refrigeration system of this unit can cause frostbite, severe burns, or blindness when in direct contact with the skin or eyes. For this reason (and because of legislation regarding the handling of refrigerants) we recommend that you contact your nearest Carrier Transicold authorized repair facility whenever service of the refrigerant system is required.

Battery

This unit is equipped with a lead-acid type battery. The battery normally vents small amounts of flammable hydrogen gas. Do not smoke when checking the battery. A battery explosion can cause serious physical harm and/or blindness.

Standby Power

Be aware of HIGH VOLTAGE supplied at the power plug. Even with the unit off, power is present from the plug to the inside of the control box. Whenever practical, disconnect the high voltage source when performing service or maintenance procedures and lockout/tagout the receptacle in accordance with your companies procedures. The recommended lockout device (Carrier part number 07–60129–00) is shown in Figure 1–1.



Figure 1–1 Lockout/Tagout

1.2 SPECIFIC WARNING AND CAUTION STATEMENTS

To help identify the label hazards on the unit and explain the level of awareness each one carries, an explanation is given with the appropriate consequences:

DANGER - warns against an immediate hazard which WILL result in severe personal injury or death.

WARNING - warns against hazards or unsafe conditions which COULD result in severe personal injury or death.

CAUTION - warns against potential hazard or unsafe practice which could result in minor personal injury, or product or property damage.

The following statements are specifically applicable to this refrigeration unit and appear elsewhere in this manual. These recommended precautions must be understood and applied during operation and maintenance of the equipment covered herein.

⚠ WARNING

Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.

⚠ WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the Main Power Switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.

⚠ WARNING

Under no circumstances should ether or any other starting aids be used to start engine.

⚠ WARNING

Ensure the power plug is clean and dry before connecting to any electrical outlet / receptacle.

⚠ WARNING

Do not connect power plug to any electrical outlet without checking that it meets the 460/3/ 60 and 30 Amp electrical requirements of the unit.

⚠ WARNING

Always place the Main Power switch in the OFF position and turn off the high voltage power supply before disconnecting the high voltage power plug from the unit.

⚠ WARNING

If the unit is in Standby Operation and powered, voltage will be applied to high voltage components (i.e. the fan motor contactor) and those components will operate (i.e. the fan blades will turn) when those components are energized using Component Test Mode.

⚠ WARNING

Do not toggle the Main Power switch out of the OFF position when in PC Mode or the unit will start.

⚠ WARNING

Do not remove the cap from a hot radiator or bottle; if the cap must be removed, do so very slowly in order to release the pressure without spray.

⚠ WARNING

Caution and good electrical practices must be used when working around and with high voltage circuits.

⚠ WARNING

Disconnect batteries before doing any electrical welding on unit or chassis to which unit is attached (trailer, container, rail car, metal building, etc).

⚠ WARNING

Use the required protective eye wear and clothing when working with solvents.

⚠ WARNING

Beware of moving poly V-belt and belt driven components.

⚠ WARNING

When working with belts, beware of pinch points.

⚠ WARNING

Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 2350 psig (159.9 bar). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8–30)

⚠ WARNING

Do not unscrew replacement compressor lifting eyelet/blankoff plate mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.

⚠ WARNING

Do not unscrew cylinder head mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.

⚠ WARNING

Do not unscrew unloader enclosing tube nut all the way before breaking seal. Entrapped pressure could result in injury.

⚠ WARNING

Do not unscrew unloader valve body mounting bolts all the way before breaking seal. Entrapped pressure could result in injury.

⚠ WARNING

Do not direct water or steam into the generator openings. Do not allow any soap and water solutions to enter the generator.

⚠ WARNING

Generators of this type should not be "flashed." Operation with external voltage source or momentary shorting of leads will damage the generator and may cause injury.

⚠ CAUTION

Under no circumstances should anyone attempt to repair the keypad, display or internal control module components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.

⚠ CAUTION

Use only ethylene glycol anti-freeze (with inhibitors) in system as glycol by itself will damage the cooling system. Always add pre-mixed 50/50 anti-freeze and water to radiator / engine. Never exceed more than a 60% concentration of anti-freeze. Use a low silicate anti-freeze meeting GM specifications GM 6038M for standard life coolant or use Texaco Havoline extended life coolant or any other extended life coolant which is Dexcool approved and has 5/150 (5 years / 150,000 miles) on the label.

⚠ CAUTION

Service Mode MUST be used whenever removing refrigerant charge, refrigerant leak checking or evacuating.

⚠ CAUTION

The display and MessageCenter may behave differently during the software loading process, depending on the version of software currently in the microprocessor. DO NOT INTERRUPT THE SOFTWARE INSTALLATION PROCESS ONCE IT HAS STARTED. Also, do not place the Main Power switch in the OFF position during the initial power up following a software upgrade.

⚠ CAUTION

Most electronic components are susceptible to damage caused by electrical static discharge (ESD). In certain cases, the human body can have enough static electricity to cause resultant damage to the components by touch. This is especially true of the integrated circuits found in the Advance microprocessor.

⚠ CAUTION

Under no circumstances should a technician electrically probe the microprocessor at any point, other than the connector terminals where the harness attaches. Microprocessor components operate at different voltage levels and at extremely low current levels. Improper use of voltmeters, jumper wires, continuity testers, etc. could permanently damage the microprocessor.

⚠ CAUTION

When setting the microprocessor time, ensure that the clock you are using is accurate. Also, some customers are located in different time zones from the repair location. If you know the owners desired location time, enter that time. If you don't, enter the current time at your location.

⚠ CAUTION

DO NOT leave the circuit energized for the full 5 minutes if full amperage is shown, as the intake air heater element life will be greatly shortened.

⚠ CAUTION

Unit uses R404A and POE oil. The use of inert gas brazing procedures is mandatory for all Carrier Transicold refrigeration units; otherwise compressor failure will occur. For more information Refer to Technical Procedure 98-50553-00 Inert Gas Brazing

⚠ CAUTION

Do not over torque display & keypad pan head screws. Torque all screws to 60 inlbs (6.8 Nm).

⚠ CAUTION

Running the engine for an extended period of time with the manual plunger up can cause a priming pump failure

⚠ CAUTION

Torque fuel level sensor mounting screws to 15 to 18 inch/pounds. DO NOT over tighten, as little as 20 inch/pounds will damage the sensor.

⚠ CAUTION

When changing oil filters, the new filters should be primed (partially filled) with clean oil if possible. If the filters are not primed, the engine may operate for a period with no oil supplied to the bearings.

⚠ CAUTION

NEVER POUR COLD WATER INTO A HOT ENGINE, however hot water can always be added to a cold engine.

⚠ CAUTION

Only a refrigerant cylinder that has previously been used with R404A should be connected to this refrigeration unit.

⚠ CAUTION

Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.

⚠ CAUTION

Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.

⚠ CAUTION

Ensure that thrust washer does not fall off dowel pins while installing oil pump.

⚠ CAUTION

An overcharge of oil will reduce system capacity and possibly cause internal compressor damage.

⚠ CAUTION

Use only Carrier Transicold approved Polyol Ester Oil (POE). Buy quantities of one gallon or less. When using this hygroscopic oil, immediately reseal. Do not leave container of oil open or contamination will occur.

⚠ CAUTION

Extreme care must be taken to ensure the hose is immersed in the oil at all times. Otherwise air and moisture will be drawn into the compressor.

⚠ CAUTION

Do not bend the copper tubing on the condenser coil when installing the new condenser. Bend the unit tubing if tubes do not align correctly.

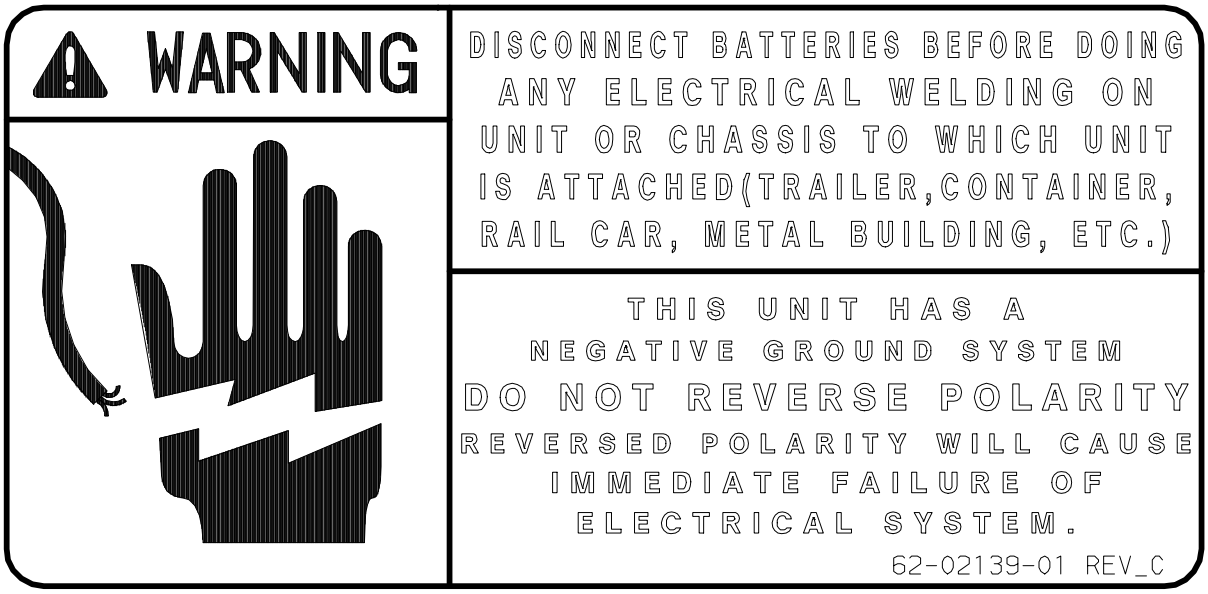
⚠ CAUTION

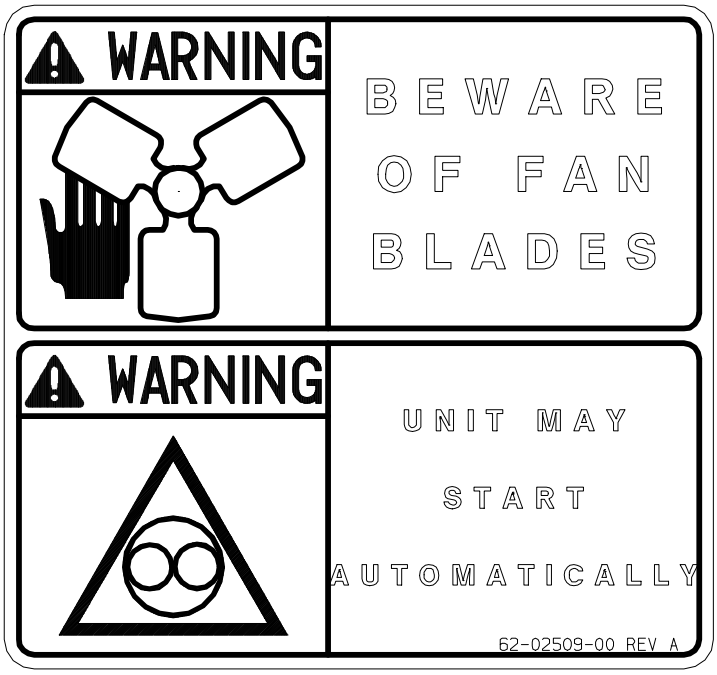
Before connecting a megohmmeter, place the Main Power switch in the OFF position. Disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. Isolate the microprocessor by disconnecting all connectors and wires going to it. Observe National Electric Manufacturer's Association (NEMA) rules and test equipment manufacturers instructions.

⚠ CAUTION

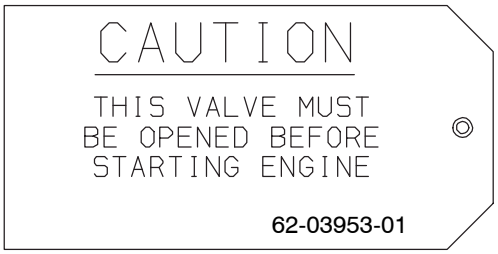
A mica shim (Carrier Transicold part number 54-00630-25) must be installed before removal of the generator. The generator is to be removed as one piece, with the shim in place. DO NOT attempt to remove the rotor from the stator.

1.3 SAFETY DECALS


WARNING
DISCONNECT BATTERIES BEFORE DOING ANY ELECTRICAL WELDING ON UNIT OR CHASSIS TO WHICH UNIT IS ATTACHED(TRAILER,CONTAINER, RAIL CAR, METAL BUILDING, ETC.)
THIS UNIT HAS A NEGATIVE GROUND SYSTEM
DO NOT REVERSE POLARITY
REVERSED POLARITY WILL CAUSE IMMEDIATE FAILURE OF ELECTRICAL SYSTEM.
62-02139-01 REV_C




WARNING
THE RECEIVER KING VALVE (LIQUID LINE SERVICE VALVE) AND DISCHARGE SERVICE VALVES MUST BE OPENED BEFORE STARTING ENGINE
62-03953-00 REV -



(NOTE: This tag is attached to the liquid line service valve and discharge service valve at assembly)

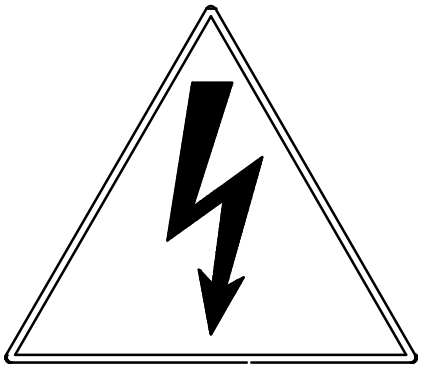
WARNING

CONTAINS HOT SURFACES THAT WILL IGNITE COMBUSTIBLES AND FLAMMABLE MATERIALS SUCH AS BIRD NESTS, LEAVES, TREE LIMBS OR MAINTENANCE MATERIALS SUCH AS SHOP RAGS. DO NOT OPERATE WITHOUT INSPECTION. FIRES AND SERIOUS INJURIES MAY RESULT.

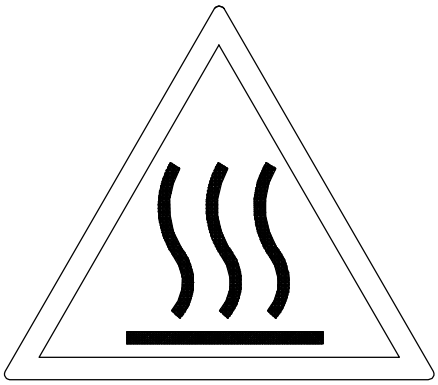
SAFETY INSTRUCTIONS

INSPECT UNIT DAILY PRIOR TO OPERATION. REMOVE ANY COMBUSTIBLE FOREIGN MATERIAL. ENSURE FACTORY INSTALLED ENCLOSURES AND PROTECTIVE EQUIPMENT ARE IN PLACE AND IN WORKING CONDITION

62-11282-00 REV - & 62-11283-00 REV B

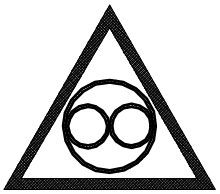


62-03957-00 & -01 High Voltage



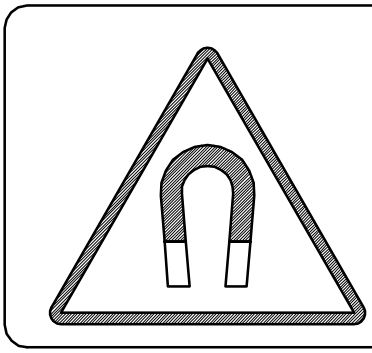
62-03958-00 Heat Warning

WARNING



UNIT MAY START AT ANY TIME IF THE RUN/STOP SWITCH IS IN THE "RUN" POSITION

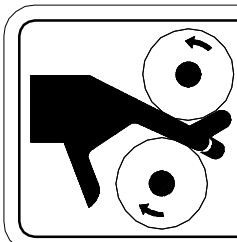
62-02450-00 REV. D



DANGER

SEPARATION OF GENERATOR ROTOR AND STATOR WILL CREATE A STRONG MAGNETIC FIELD THAT CAN INTERFERE WITH CARDIAC IMPLANTS SUCH AS PACEMAKERS AND DEFIBRILLATORS

62-10358-00 REV A



DANGER

KEEP CLEAR OF ROTATING BELTS AND PULLEYS

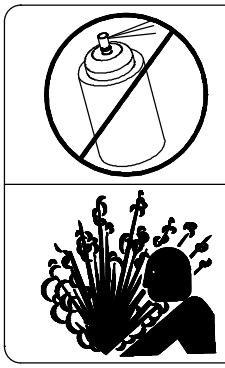
62-02144-03 REV D

NOTE:
The unit may be equipped with a DIESEL/OFF/STANDBY switch (DOES) or a START/RUN-OFF switch (SROS). The unit may start if the applicable switch is <u>not</u> in the OFF position.

⚠ CAUTION

THE ENGINE SPEED ON THIS UNIT
MUST BE SET AT 1350 RPM ON LOW SPEED
AND AT 1800 RPM ON HIGH SPEED.
INCORRECT SPEED SETTINGS
MAY CAUSE THE GENERATOR
TO RUN AT THE WRONG VOLTAGE.

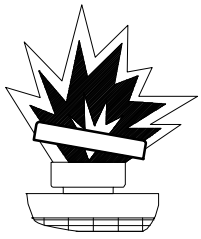
62-11450-00



⚠ WARNING

CONTAINS AIR HEATER
THAT COULD IGNITE
FLUIDS. NEVER USE
STARTING AIDS,
INCLUDING ETHER.
FIRE AND SERIOUS
INJURIES COULD RESULT.

62-11302-00 REV C



⚠ CAUTION

REMOVE
FILLER CAP
SLOWLY

62-02142-01 REV_B

RADIATOR COOLANT INSTRUCTIONS

TOP-COOLANT INTO RECOVERY BOTTLE ONLY
FILL EMPTY RADIATOR THROUGH FILLER NECK
SLOWLY TO AVOID AIR ENTRAPMENT

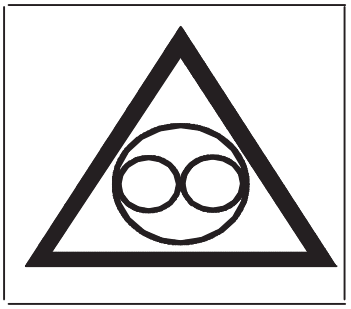
⚠ CAUTION



REPLACE
COVERS AFTER
SERVICING
BATTERY
TO INSURE
PROTECTION
OF BATTERY
AND
TERMINALS

62-02505-00 REV B

⚠ WARNING



UNIT MAY START AUTOMATICALLY

62-02146-00 REV_A

THIS UNIT CHARGED WITH

R-404A

CAUTION !

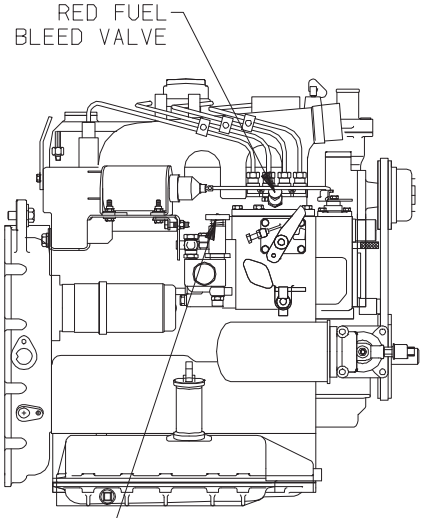
COMPRESSOR MUST BE CHARGED WITH
P.O.E. OIL ONLY: CTD P/N: 07-00317-00
MOBIL ARCTIC P.N: EAL63

CTD P.N: 62-03797-11

INSTRUCTIONS FOR PRIMING THE FUEL SYSTEM

WHEN CHANGING THE FUEL FILTER, OPENING THE FUEL LINES FOR ANY REASON, OR IF THE SYSTEM HAS BEEN RUN OUT OF FUEL, FOLLOW THESE STEPS TO RE-PRIME THE ENGINE AFTER REFUELING THE TANK:

1. OPEN THE RED FUEL BLEED VALVE LOCATED JUST ABOVE THE ENGINE RUN LEVER.
2. THE MANUAL FUEL PUMP PLUNGER LOCATED APPROXIMATELY 3" LEFT OF THE RED FUEL BLEED VALVE, HAS A HAND PUMP. TURN THE KNOB COUNTER-CLOCKWISE TO RELEASE THE PUMP PLUNGER AND IT WILL SPRING UP.
3. SLOWLY OPERATE THE MANUAL PUMP A MAXIMUM ONE STROKE PER SECOND WITH FULL EVEN STROKES. PUMP UNTIL FUEL CAN BE FELT FLOWING THROUGH THE PUMP. ONE HUNDRED OR MORE STROKES MAY BE REQUIRED TO FULLY PRIME THE ENGINE. IT MAY BE NECESSARY TO PUMP MORE THAN THIS IF THE FUEL FILTER IS EMPTY.
4. CRANK THE ENGINE TO START THE UNIT. IT MAY BE NECESSARY TO CONTINUE TO PUMP UNTIL THE ENGINE STARTS. TO PREVENT POSSIBLE FUEL SOLENOID FAILURE, DO NOT ATTEMPT MORE THAN 3 CONSECUTIVE STARTS WITHOUT A THIRTY SECOND DELAY BETWEEN EACH START ATTEMPT. IF THE UNIT DOES NOT START AFTER 3 ATTEMPTS, REPEAT STEP 3.
5. DEPRESS AND TURN THE TOP OF THE MANUAL FUEL PUMP PLUNGER CLOCKWISE TO LOCK IN PLACE.
6. AFTER THE UNIT IS RUNNING, CLOSE THE RED FUEL BLEED VALVE.



CAUTION RUNNING THE ENGINE FOR EXTENDED PERIODS OF TIME WITH THE MANUAL FUEL PUMP PLUNGER UP, CAN CAUSE A PRIMING PUMP FAILURE.

CTD P/N 62-11416-00 REV A

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SECTION 2

UNIT DESCRIPTION

2.1 INTRODUCTION

⚠ WARNING

Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.

⚠ WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the Main Power Switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.

This manual contains operating data, electrical data and service instructions for the Vector 6500 refrigeration system. Refer to Table 2-1 for model information.

Additional support manuals are listed in Table 2-2.

The unit model/serial number plate is located inside the unit on the frame as shown in Figure 2–1.

2.2 GENERAL DESCRIPTION

The Vector 6500 unit is a hybrid diesel/electric, fully charged, pre-wired, refrigeration/heating "nosemount" unit. The unit is used on insulated refrigerated compartments to maintain cargo temperatures within very close limits.

Electrical power is supplied to the unit from a power plug or by the A-C generator which is driven by the engine. The generator provides nominal 480V/3Ø/60Hz power when the engine is in high speed and nominal 350V/3Ø/45Hz power in low speed.

The control box includes manual switches, microprocessor, fuses, and associated wiring. The unit can be equipped with an optional remote light bar which mounts separately on the front roadside corner of the trailer.

Temperature control is provided by the Carrier Transicold Advance microprocessor (Refer to Section 2.5). Once the microprocessor is set at the desired temperature, the unit will operate automatically to maintain the desired temperature within very close limits. The control system automatically selects high and low speed cooling or high and low speed heating as necessary to maintain the desired temperature within the refrigerated compartment.

The auto Start-Stop operation provides automatic cycling of the diesel engine, which in turn offers an energy efficient alternative to continuous operation of the engine with control of temperature by alternate cooling and heating of the supply air (evaporator outlet air). The auto Start-Stop feature is standard equipment.

The unit can be described as having three major sections:

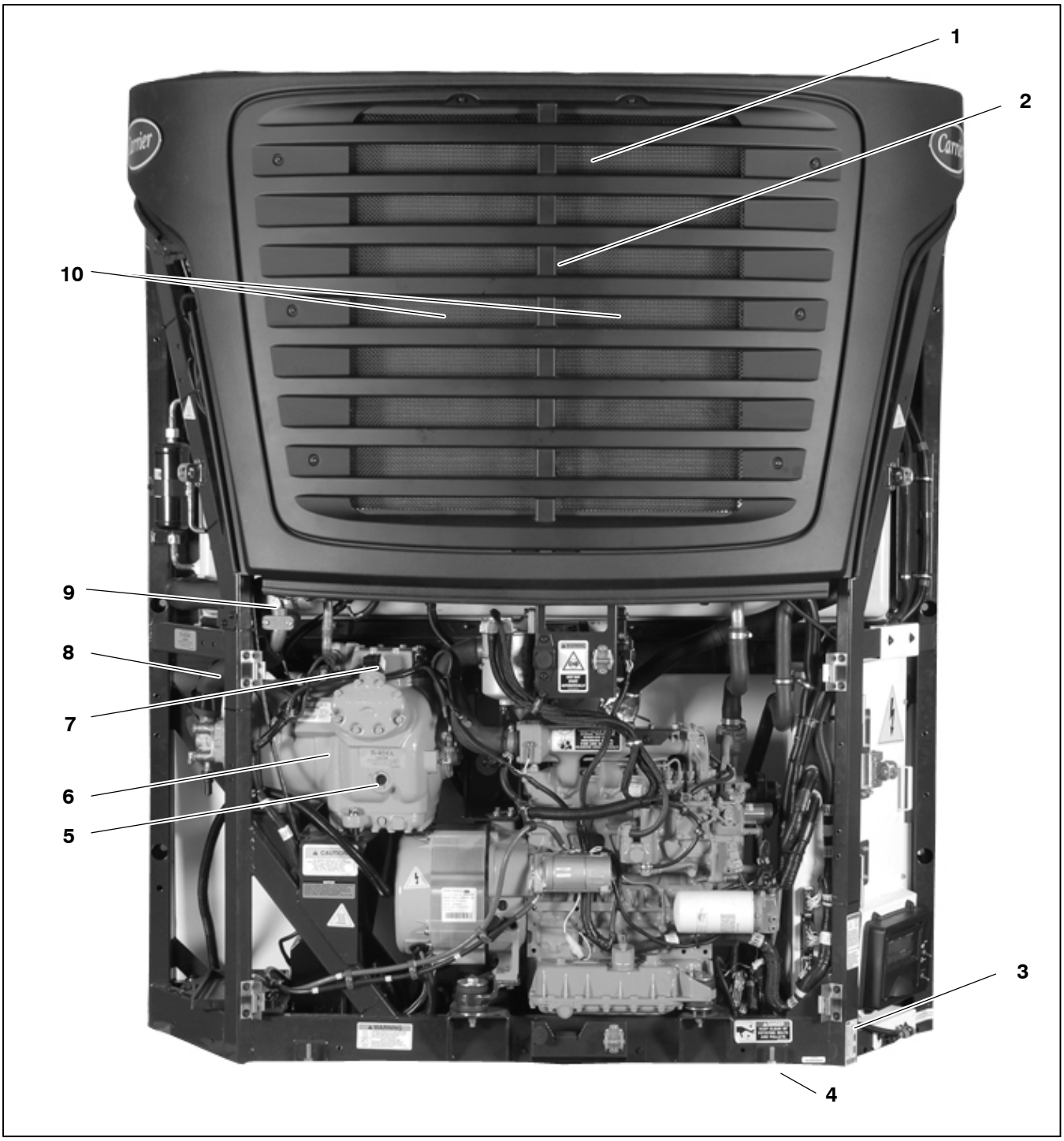
- the condensing section (Figure 2–1 & Figure 2–2), which includes the engine generator drive package (Figure 2–3).
- the evaporator section (Figure 2–4).
- the controls (Items 11 through 14, Figure 2–3: Figure 2–5 & Figure 2–9).

Table 2-1 Model Chart

Model	R-404A		Compressor	Engine	Engine Speed	
	LB	KG			High	Low
NDP532*6JB0	14	6.4	06D 41cfm	V2203-L-DI-E3B-CTD-5	1800	1350

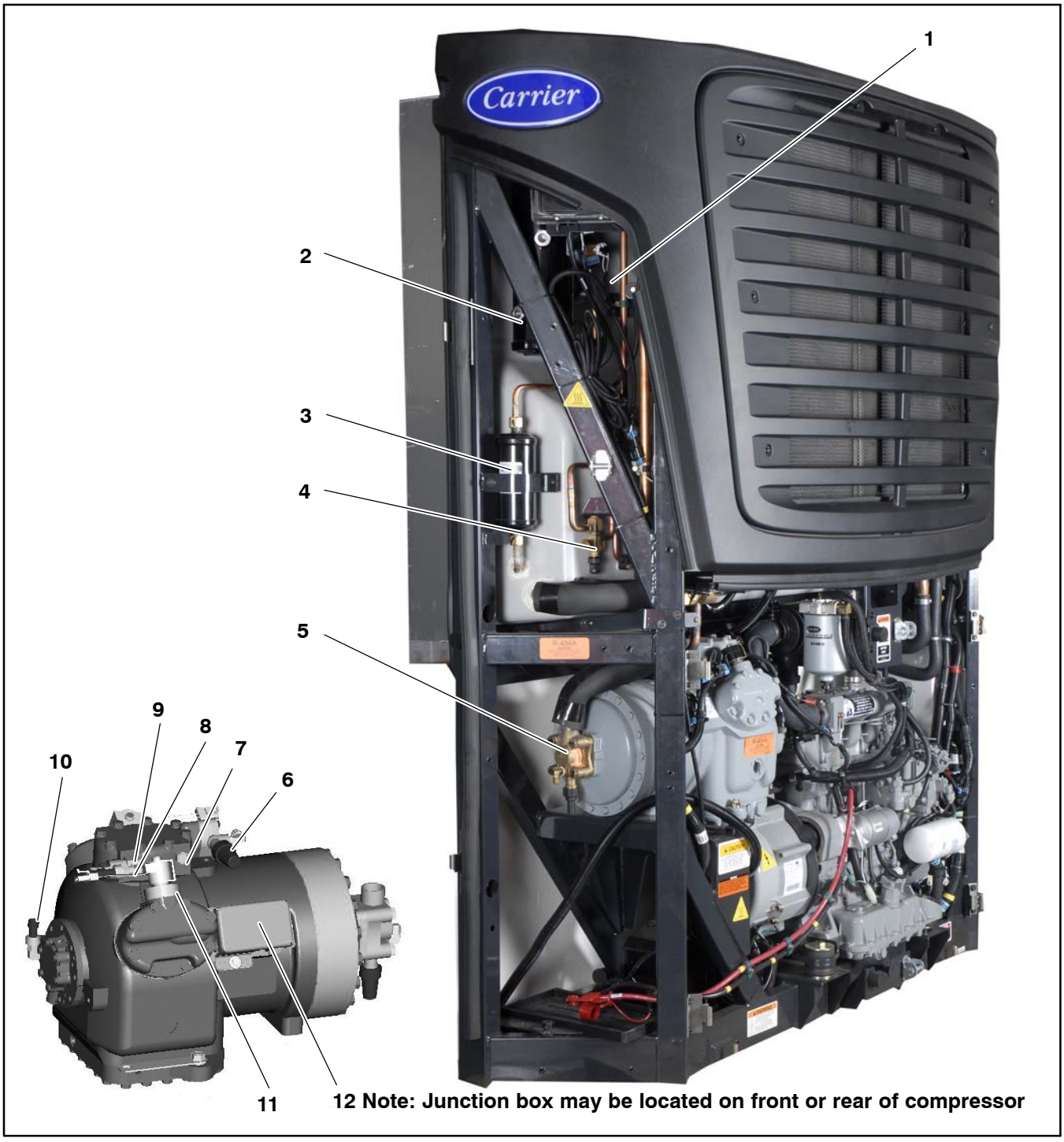
Table 2-2 Additional Support Manuals

Manual Number	Type of Manual
62-11369	Parts Look Up System (PLUS disc)
62-11405	Operator's Manual
62-11406	Easy To Run



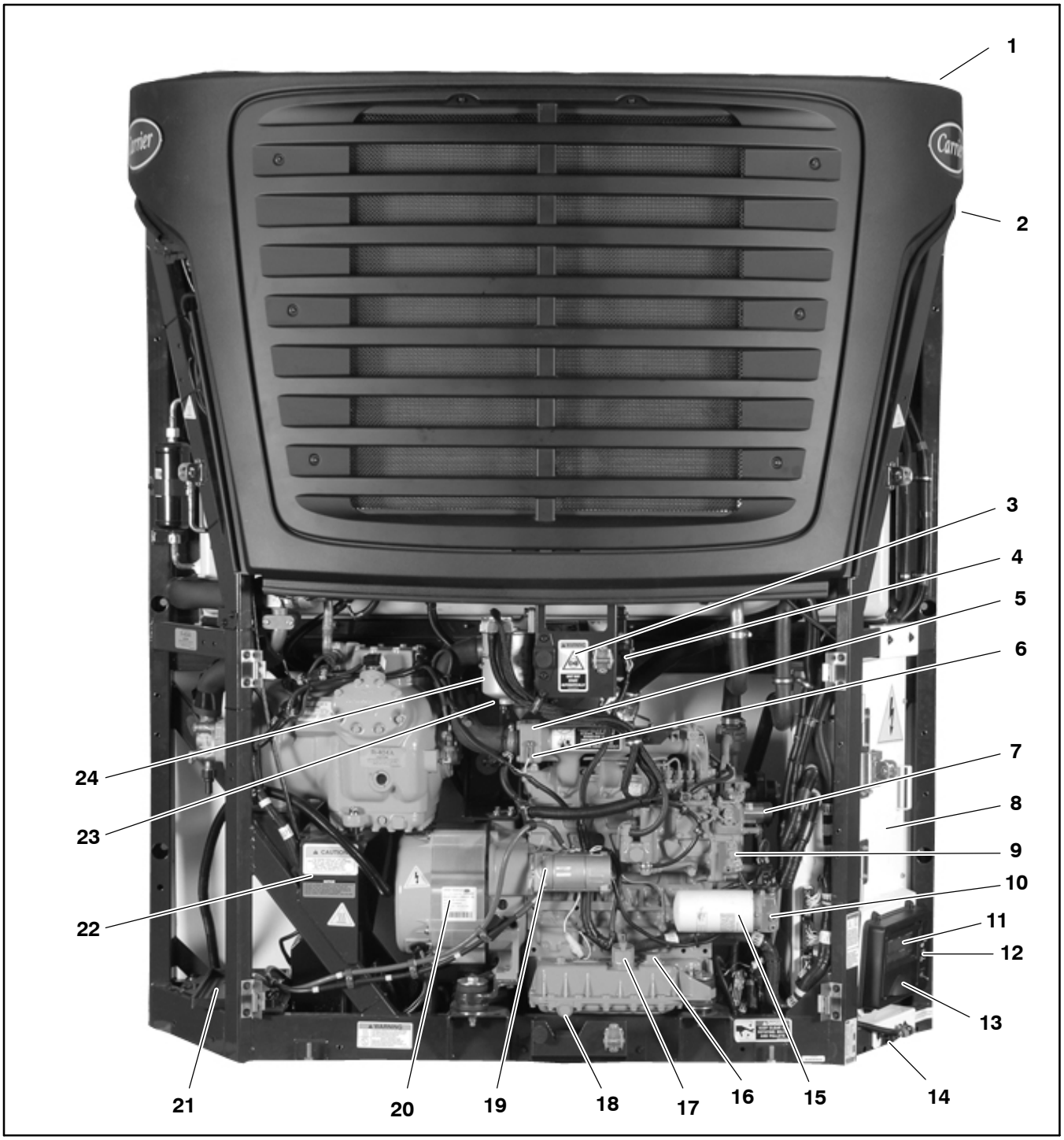
1. Condenser & Radiator
2. Ambient Air Temperature Sensor (ATT - behind grille)
3. Model/Serial Number Nameplate
4. Power Supply Receptacle (PSR - Under Unit)
5. Compressor Sight Glass
6. Compressor (C)
7. Front Unloader Valve (UL1)
8. Compressor Suction Temperature Sensor (CST)
9. Compressor Suction Modulation Valve (CSMV)
10. Condenser Fans and Motors (CDM1 & CDM2)

Figure 2–1 Front View - Refrigeration System Components



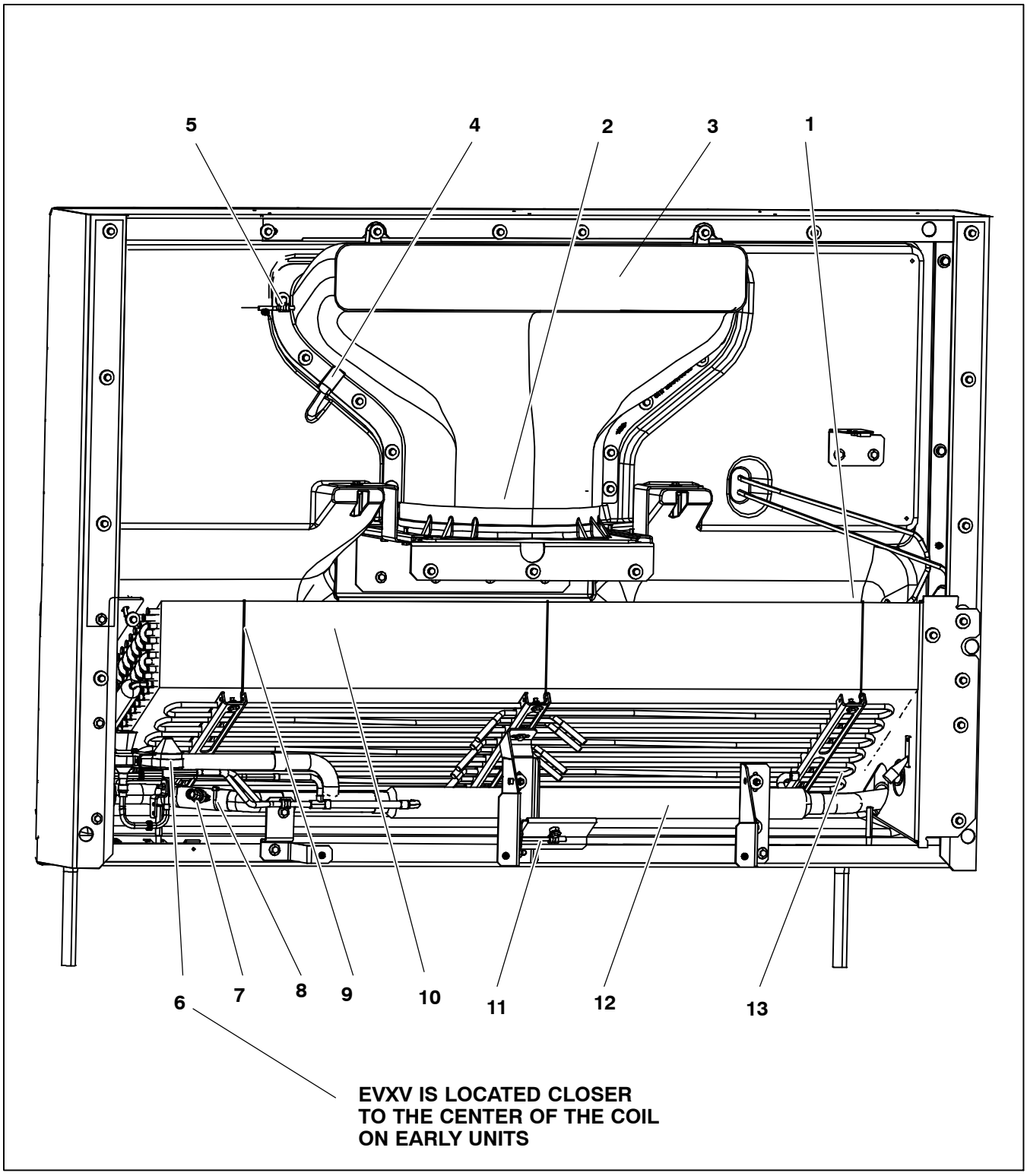
1. Defrost Air Switch (DAS)
2. Receiver & Sight Glasses
3. Filter-Drier
4. Liquid Line Service Valve
5. Compressor Suction Service Valve
6. Compressor Discharge Service Valve
7. Compressor Discharge Temperature Sensor (CDT)
8. Compressor Discharge Pressure Transducer (CDP)
9. High Pressure Switch (HP1)
10. Compressor Suction Pressure Transducer (CSP)
11. Rear Unloader Solenoid Valve (UL2)
12. Compressor Junction Box (IPC location)

Figure 2–2 Road Side/Rear Compressor View - Refrigeration System Components



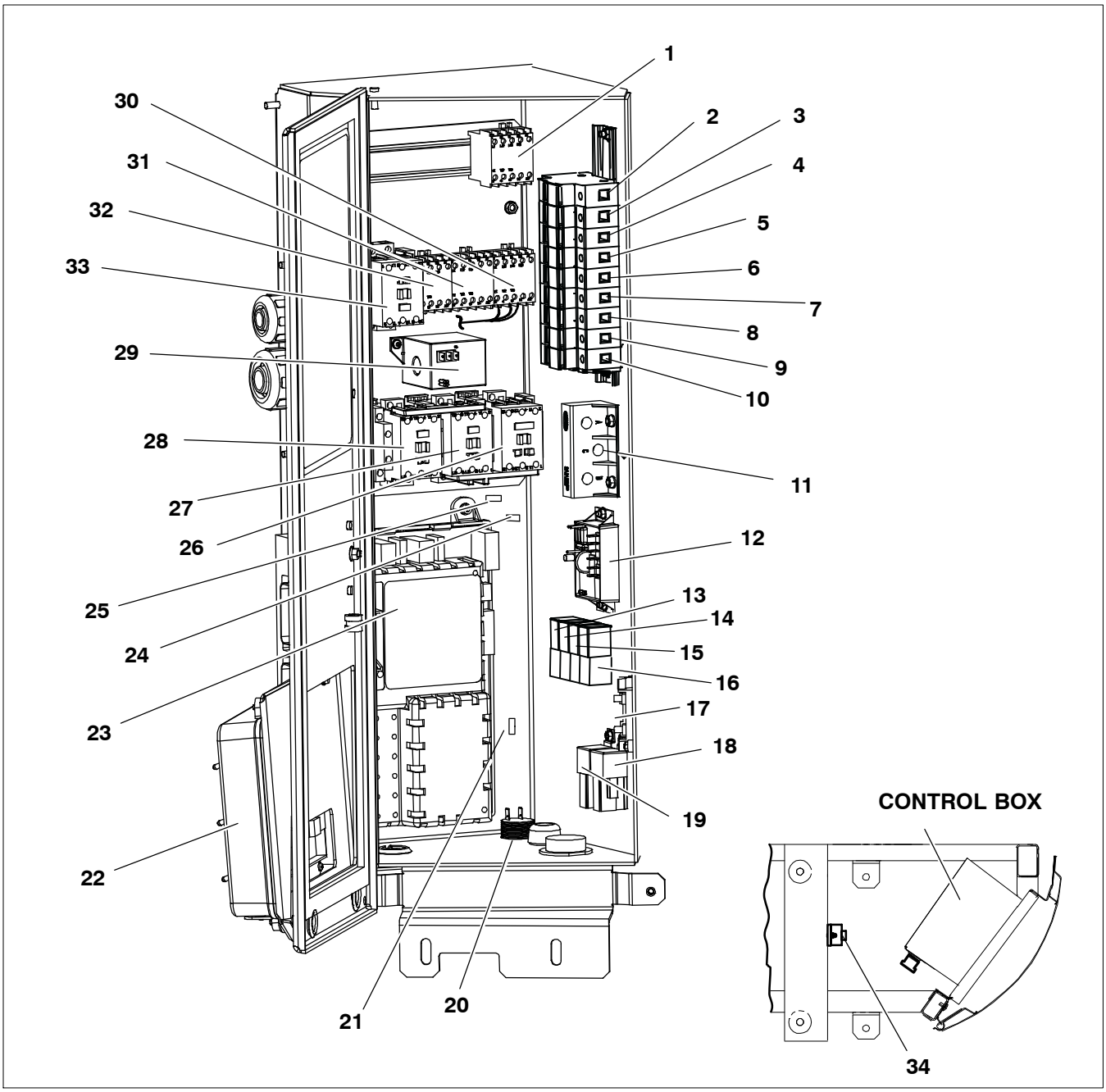
1. Exhaust (Location)
2. Coolant Bottle (Location)
3. Air Cleaner & Air Cleaner Service Indicator (Behind bracket)
4 Engine Speed Control Unit (ENSCU)
5. Engine Coolant Temperature Sensor (ENCT)
6. Intake Air Heater (IAH)
7. Fuel/Speed Actuator (FSA)
8. Control Box (Refer to Figure 2–5)
9. Engine Speed Sensor (ENSSN)
10. Engine Oil Pressure Switch (ENOPS)
11. Display
12. Switch Board
13. Keypad Door
14. Serial Download Port (SLP)
15. Lube Oil Filter
16. Engine Oil Level Switch (ENOLS)
17. Lube Oil Fill & Dipstick
18. Lube Oil Drain
19. Starter Motor (SM)
20. Generator (GEN)
21. Battery Tray
22. Battery Charger (BTYC) and Second Battery Charger (BTYC2) Mounting
23. Fuel Heater (FH - Location)
24. Fuel Filter

Figure 2–3 Front View - Engine Components



1. Defrost Termination Temperature Sensor (DTT - Located on curbside tube sheet)
2. Evaporator Air Nozzle
3. Evaporator Fan/Motor Assembly (EVM)
4. Evaporator Fan/Motor Wiring
5. Supply Air Temperature Sensor (1SAT)
6. Electronic Expansion Valve (EVXV)
7. Evaporator Outlet Pressure Transducer (EVOP)
8. Evaporator Outlet Temperature Sensor (EVOT - On suction line under insulation)
9. Evaporator High Temperature Switch (1EVHTS - Located on roadside tube sheet)
10. Evaporator Coil
11. Return Air Temperature Sensor (1RAT)
12. Heat Exchanger
13. Electric Heaters (HTR1, HTR2)

Figure 2–4 Evaporator Section - Grille Removed



1. Heat Contactor 1 (1HTCON1)
2. Fuse (F28)
3. Fuse (F27)
4. Fuse (F26)
5. Fuse (F12)
6. Fuse (F11)
7. Fuse (F10)
8. Fuse (F8)
9. Fuse (F7)
10. Fuse (F29)
11. AC Current Sensor (CT2,3,4)
12. Phase Reversal Module (PRM)
13. Fuel Heater Relay (FHR)
14. Power Supply Contactor Relay (PSCONR)
15. Generator Contactor Relay (GENCONR)
16. Compressor Contactor Relay (CCONR)
17. Main Fuse (F5)
18. Air Heater Relay (IAHR or GPR)
19. Starter Solenoid Relay (SSR)
20. Buzzer (B)
21. Fuse (F19)
22. Display
23. Microprocessor (MP)
24. Fuse - Standby Contactor Power (F9)
25. Microprocessor Power Fuse (F6)
26. Power Supply Contactor (PSCON)
27. Power Supply Contactor 2 (PSCON2)
28. Generator Contactor (GENCON)
29. Overload Ground Fault (OGF)
30. Condenser Motor Contactor (CDCON)
31. Evaporator Motor Contactor (1EVCON)
32. Heat Contactor 2 (1HTCON2)
33. Compressor Contactor (CCON)
34. Run Control Relay (RCR - Used With Remote Control Panel Only)

Figure 2–5 Control Box

2.3 CONDENSING SECTION

The condensing section (see Figure 2−1 & Figure 2−2) consists of an engine-generator drive package, compressor, condenser fans, condenser coil, radiator, refrigerant controls, defrost air switch, piping, wiring, and associated components.

The engine-generator drive package (see Figure 2−3) includes the engine, generator, air cleaner, muffler, coolant system, fuel system, oil filter system and engine sensors.

2.3.1 Engine

The engine is a four cylinder diesel which gives excellent fuel economy and has easy starting characteristics. It is equipped with spin-on lube oil and fuel oil filters for easier filter changes. The fuel filter may also be equipped with a thermostatically controlled fuel heater. The engine cooling system consists of the radiator (which is mounted with the condenser coil) and coolant overflow bottle. The system is also fitted with an electronic battery charger which converts generator or standby alternating current to direct current for battery charging. Refer to Section 2.8 for engine data.

2.3.2 Engine Air System

The air cleaner prolongs the life and performance of the engine by preventing dirt and grit from getting into the engine and causing excessive wear on all operating parts. It is the responsibility of the operator to give the air cleaner equipment regular and constant attention in accordance with the instructions. An optional air cleaner service indicator may be connected to the intake manifold. Its function is to indicate when the air cleaner requires replacement. (Refer to section 8.5.9.)

2.3.3 Engine Controls:

a. Engine Speed Control Unit (ENSCU)

The ENSCU (see Figure 2−6) is a microprocessor based unit which controls the fuel supply to, and speed of, the engine in accordance with the position of the Main Power Switch and speed relay.
The unit has an LED which may be used to diagnose failures within the electronic speed control system. Refer to Section 9.5 for information on diagnostic failures.
The ENSCU sends engine speed information to the microprocessor to be displayed in the Unit Data and recorded in the DataLink data recorder. The ENSCU is mounted on the air cleaner bracket.

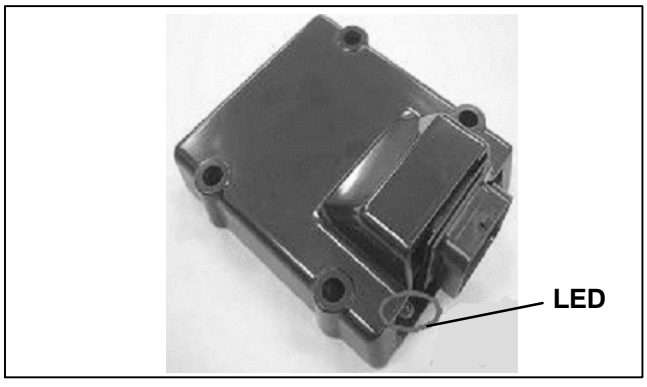


Figure 2−6 Engine Speed Control Unit

b. Fuel/Speed Actuator (FSA)

The FSA combines the fuel shutoff solenoid and speed control solenoid into one component. Fuel supply to the injectors and engine speed is controlled by varying rod position in accordance with the signal from the ENSCU. The FSA is located on the front of the injection pump.

c. Engine Speed Sensor (ENSSN)

The ENSSN provides the ENSCU with information on the speed at which the engine is running. The ENSSN is located in the gear case cover above the oil filter.

d. Engine Oil Pressure Switch (ENOPS)

The ENOPS is normally open and closes on pressure rise to signal to the microprocessor the engine has sufficient oil pressure for operation. There is a 15 second delay after the engine starts to allow the oil pressure to build up before the microprocessor looks at the input from this switch. The switch is located in the oil filter mounting assembly.

e. Engine Coolant Temperature Sensor (ENCT)

The ENCT provides the microprocessor with engine coolant temperature information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. The sensor is located on the starter side of the engine near the #4 Injector.

f. Engine Oil Level Switch (ENOLS)

The ENOLS provides the microprocessor with engine oil level information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. The switch is located in the oil pan, just to the right of the lube oil fill & dipstick.

2.3.4 Generator (GEN)

The generator is directly bolted to the engine and supplies nominal 460V/3Ø/60Hz power when the engine is in high speed and nominal 300V/3Ø/45Hz power in low speed.

2.3.5 Compressor

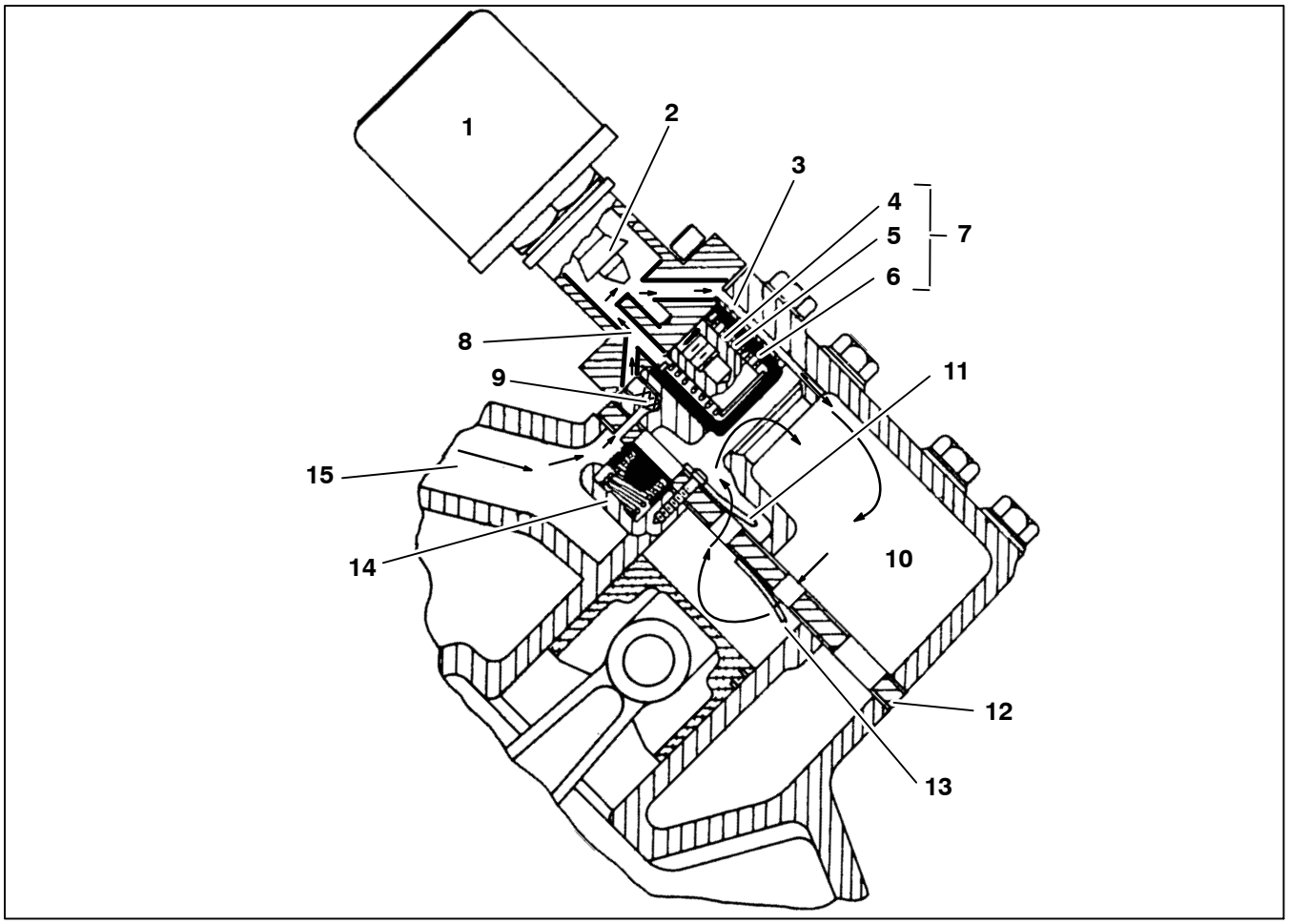
The compressor assembly includes the refrigerant compressor, suction and discharge service valves, high pressure switch, compressor discharge temperature sensor and the suction and discharge pressure transducers. The compressor draws refrigerant gas from the evaporator and delivers it to the condenser at an increased temperature and pressure. The pressure is such that refrigerant heat can be absorbed by the surrounding air at ambient temperatures.

2.3.6 Unloaders

The compressor is equipped with unloaders as standard equipment. Unloaders are used as a compressor capacity control to unload the cylinder banks during periods of reduced cooling loads. This provides closer temperature control and reduces the power required to operate the compressor; thus reducing fuel consumption.

a. Major Working Parts

- Solenoid and valve system.
- Spring loaded piston type bypass valve.
- Spring loaded discharge check valve (located on the valve plate).



1. Solenoid Valve
2. Valve Stem
3. Gas Bypass Port
4. Spring Guide
5. Spring
6. Piston
7. Bypass Valve
8. Bleed Orifice
9. Strainer
10. Suction Manifold
11. Cylinder Discharge Valve
12. Valve Plate
13. Cylinder Suction Valve
14. Discharge Check Valve Assembly
15. Discharge Manifold

Figure 2–7 Compressor Cylinder Head Unloaded

b. Unloaded Operation

Pressure from the discharge manifold (item 15, Figure 2–7) passes through the strainer (9) and bleed orifice (8) to the back of the bypass valve piston (6). Unless bled away, this pressure would tend to close the piston against the spring (5) pressure and load the cylinders in that head.

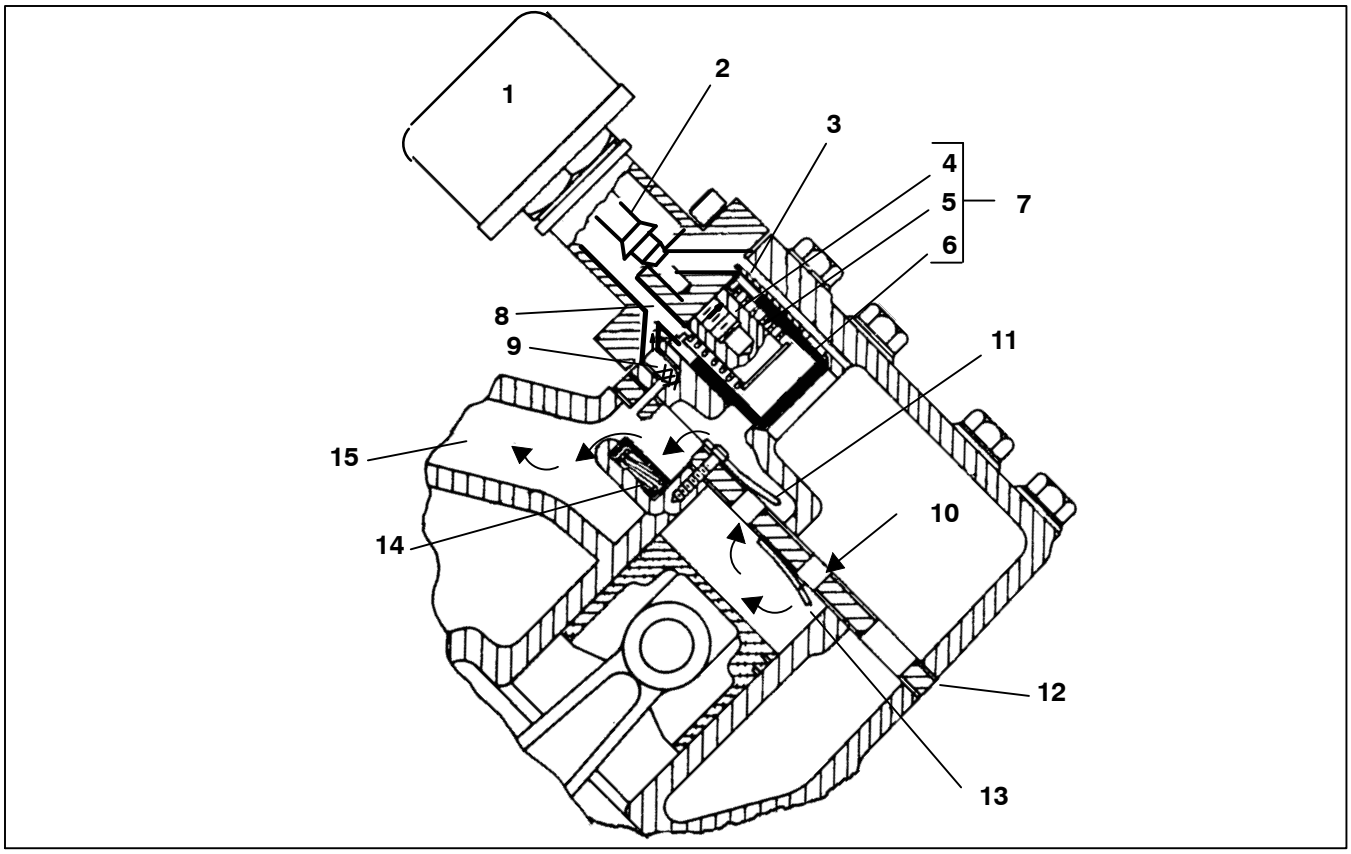
With the solenoid valve (1) energized the solenoid valve stem (2) will open the gas bypass port (3).

Discharge pressure will be bled to the suction manifold (10) through the opened gas bypass port . A reduction in pressure on the bypass piston valve will take place because the rate of bleed through the gas bypass port is greater than the rate of bleed through the bleed orifice (8).

When the pressure behind the piston has been reduced sufficiently, the valve spring will force the piston back, opening the gas bypass from the discharge manifold to the suction manifold.

Discharge pressure in the discharge manifold will close the discharge piston check valve assembly (14) isolating the compressor discharge manifold from the individual cylinder bank manifold.

The unloaded cylinder bank will continue to operate fully unloaded until the solenoid valve is de-energized and the gas bypass port is closed.



1. Solenoid Valve
2. Valve Stem
3. Gas Bypass Port
4. Spring Guide
5. Spring
6. Piston
7. Bypass Valve
8. Bleed Orifice
9. Strainer
10. Suction Manifold
11. Cylinder Discharge Valve
12. Valve Plate
13. Cylinder Suction Valve
14. Discharge Check Valve Assembly
15. Discharge Manifold

Figure 2–8 Compressor Cylinder Head Loaded

c. Loaded Operation

With the solenoid valve (1, Figure 2–8) de-energized the solenoid valve stem will close the gas bypass port (3).

Pressure from the discharge manifold (item 15) through the strainer (9) and bleed orifice (8) will build behind the piston (6).

This increased pressure will overcome the bypass valve spring (5) tension and force the piston (6) forward closing the gas bypass from the discharge manifold to the suction manifold (10).

Cylinder discharge pressure will force the discharge check valve assembly (14) open. Refrigerant gas will then flow into the compressor discharge manifold.

The loaded cylinder bank will continue to operate fully loaded until the solenoid valve is energized and the gas bypass port is opened.

2.3.7 Compressor Switches, Transducers and Sensors

a. Compressor Discharge Pressure Transducer (CDP)

The CDP provides a signal to the microprocessor equivalent to pressure leaving the compressor. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the compressor center head.

b. Compressor Suction Pressure Transducer (CSP)

The CSP provides a signal to the microprocessor equivalent to pressure entering the compressor cylinders. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the front of the compressor.

c. Compressor Discharge Temperature Sensor (CDT)

The CDT provides a signal to the microprocessor equivalent to the temperature of the gas leaving the compressor. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the compressor center head.

d. Compressor Suction Temperature Sensor (CST)

The CST provides a signal to the microprocessor equivalent to to the temperature of the gas entering the compressor suction service valve. It is located on the line entering the valve.

e. High Pressure Switch (HP1)

The HP1 is normally closed and opens on pressure rise to signal to the microprocessor to shutdown the engine, or shutdown the system if operating on standby power. It is located on the compressor center head.

2.3.8 Condenser Coil

The condenser coil is a microchannel type and acts as a heat exchanger in which the compressed refrigerant gas is lowered in temperature and condensed into a liquid. Air movement over the condenser is provided by two electric motor driven fans mounted in the condensing section.

2.3.9 Ambient Air Temperature Sensor (AAT)

The AAT provides microprocessor with condenser entering air temperature information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. The sensor is located behind the front grill.

2.3.10 Filter-Drier

The filter-drier is a cylindrical shell containing a drying agent and filter screen. It is installed in the liquid line and functions to keep the system clean and remove moisture from the refrigerant.

2.3.11 Receiver

Liquid refrigerant from the condenser flows into the receiver. The receiver serves as a liquid reservoir when there are surges due to load changes in the system; as a storage space when pumping down the system and as a liquid seal against the entrance of refrigerant gas into the liquid line.
The receiver is provided with two bull's-eye sight glasses, for the observation of liquid level & moisture content, and a fusible plug.

2.4 EVAPORATOR SECTION

The evaporator (See Figure 2–4) fits into a rectangular opening in the upper portion of the front wall of the refrigerated compartment. When installed, the evaporator section is located inside the compartment, and the condensing section is outside.

The evaporator assembly consists of an evaporator coil, evaporator fan motor, electronic expansion valve, coil heaters, heat exchanger, defrost termination temperature sensor the supply and return air sensors and a high temperature switch.

Heating and defrost is accomplished by electric heaters mounted on the coil.

Automatic evaporator coil defrosting is initiated by either a differential air switch (which senses the pressure drop across the coil) or by the defrost timer in the microprocessor.

2.4.1 Evaporator Coil

The evaporator is a tube in fin type. The operation of the compressor maintains a reduced pressure within the coil. At this reduced pressure, the liquid refrigerant evaporates at a temperature sufficiently low enough to absorb heat from the air. The electric heaters (HTR1 & HTR2) are mounted on the inlet side of the coil.

2.4.2 Electronic Expansion Valve (EVXV)

The EVXV is an electronic device which controls the flow of liquid to the evaporator according to changes in superheat of the refrigerant leaving the evaporator. The expansion valve maintains a relatively constant degree of superheat in the gas leaving the evaporator regardless of suction pressure. The valve has a dual function - automatic expansion control and prevention of liquid return to the compressor.

2.4.3 Heat Exchanger

The heat exchanger is the tube in tube type and is installed in the main suction line and liquid line. The suction gas is used to cool the warm liquid refrigerant within the heat exchanger. This results in greater system efficiency.

2.4.4 Compressor Suction Modulation Valve (CSMV)

The CSMV opens and closes as required for capacity control of the refrigeration system cooling cycle. It is located in the suction line at the exit of the evaporator assembly.

2.4.5 Evaporator Switches, Transducers and Sensors

a. Evaporator Outlet Pressure Transducer (EVOP)

The EVOP provides the microprocessor with evaporator outlet pressure information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located in the suction line near the electronic expansion valve.

b. Evaporator High Temperature Switch (1EVHTS)

1EVHTS is a safety switch which opens on a temperature rise to de-energize the electric heaters if the temperature reaches the cut-out point. It is located on the roadside tube sheet of the evaporator coil

c. Evaporator Outlet Temperature Sensor (EVOT)

The EVOT provides the microprocessor with evaporator outlet temperature information to be displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on the suction line near the electronic expansion valve.

d. Defrost Termination Temperature Sensor (1DTT)

The 1DTT is located on the curbside tube sheet of the evaporator coil. It provides the microprocessor with evaporator temperature information to be displayed, recorded in the DataLink data recorder and used to determine termination of defrost.

e. Return Air Temperature Sensor (1RAT)

The 1RAT is a temperature control probe which provides the microprocessor with information on the temperature of the air entering the evaporator section. The

reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located on on a bracket behind the center of the return air grille.

f. Supply Air Temperature Sensor (1SAT)

The 1SAT is a temperature control probe which provides the microprocessor with information on the temperature of the air leaving the evaporator section. The reading is displayed, recorded in the DataLink data recorder and used to control the refrigeration system. It is located in the roadside of the supply air outlet housing.

2.5 SYSTEM OPERATING CONTROLS AND COMPONENTS

Temperature control is provided by the Carrier Transicold Advance microprocessor. Once the microprocessor is set at the desired temperature, the unit will operate automatically to maintain the desired temperature within very close limits.

2.5.1 Multiple Languages

Messages in the MessageCenter can be displayed in English, French, Spanish or Portuguese.

Press and hold the Select Key for 6 seconds to view or change the current language selection. Refer to Section 3.15 for more information on language selection.

2.5.2 Automatic Start-Stop

Standard equipment includes an auto start-stop feature. This feature provides automatic cycling of the diesel engine, which in turn offers an energy efficient alternative to continuous operation of the engine with control of temperature by alternate cooling and heating of the supply air (evaporator outlet air).

2.5.3 Special Features

The following additional special features are incorporated into the Carrier Transicold Advance Microprocessor:

- An LCD display MessageCenter which clearly displays all information in dot matrix form.
- Unit Operation & Alarms are displayed in text (not in codes).
- Unit Data and Functional Parameters.
- Programmable Maintenance Hour Meters (resettable from the Keypad).
- Bright LED Alarm & Indicator Lights.
- Fully Automated Pretrip.
- Automated Micro Self-test.
- DataLink data recorder (date & time can be set from the Keypad).
- Trip Start to record date/time of trip in DataLink data recorder memory.
- PC card functionality for downloading data, upgrading operational software, and Configuration set up.
- FET (Field Effect Transistor) indicating LEDs that are illuminated when a circuit is energized.
- Automatic Engine Starting.
- Functional Parameter locks.
- Alarms are stored in microprocessor memory for future reference.

2.5.4 Component Description And Location

The hardware associated with the Advance microprocessor includes the control module, display, keypad and switch board. The hardware is housed, for driver access, in the control box on the lower roadside corner of the unit.

⚠ CAUTION

Under no circumstances should anyone attempt to repair the keypad, display or internal control module components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.

a. Control Module

The control module (see Figure 2–9) consists of the microprocessor (with status LEDs), 3 fuses (F1, F2, & F3), a DC current sensor (CT1), 2 relays (RR & SR), 2 status LED's (LED30 & LED31), 6 input/output connectors (QC), 6 digital input/output connectors (MP), a programming card slot (with status LED's) and twenty three FET indicating LEDs.

The microprocessor is totally self contained and does not contain any serviceable components. Microprocessor activity can be determined by observing the LED's and FET's (see Figure 2–9 and Table 5–1). If the microprocessor is calling for a circuit to be energized, the indicator is illuminated.

The PC card slot allows programming of the microprocessor using Carrier Transicold PC Cards. The microprocessor automatically detects the presence and type of PC Card inserted and responds accordingly. The different types of PC Cards are:

- Download Card for copying unit data from DataLink data recorder.
- Options PC Card for installing optional software programs such as DataTrak or IntelliSet.
- Configuration PC Card for setting the Microprocessor Functions, Configurations, IntelliSets and DataLink data recorder Configurations.
- Program PC Card for upgrading the microprocessor software.

There are three LEDs associated with the function of the PC card slot. These are:

- A green Micro Status LED which will blink steadily once per second indicating that the microprocessor is operating and will blink every 0.5 seconds if there is no software or if it is loading software.
- A green (PC) Card Status LED which comes on when there is a PC card inserted in the slot. This LED will:

1. Blink once per second when data is being transferred to, or from, the PC Card. Will be on steady when the operation is complete indicating the PC Card may be removed.
2. During Download, after Card is read and identified, card status LED blinks 2 seconds on and 2 seconds off until the = key is pressed to start the programming from the card to the micro. Once the data transfer to the micro begins, the Card Status LED and the Micro Status LED will blink together 1/2 second on and 1/2 second off until the data transfer is complete, then the Micro Status LED will continue at the 1/2 second rate and the Card Status LED will come on solid and remain on solid until the card is removed from the slot.

- A red (PC) Card Fault LED blinks if there is a problem transferring data from the PC card that has been plugged into the PC card slot. The red LED will continue to blink until the PC card is removed. The LED will also blink if there is an error reading the card. Check the MessageCenter for description of error.

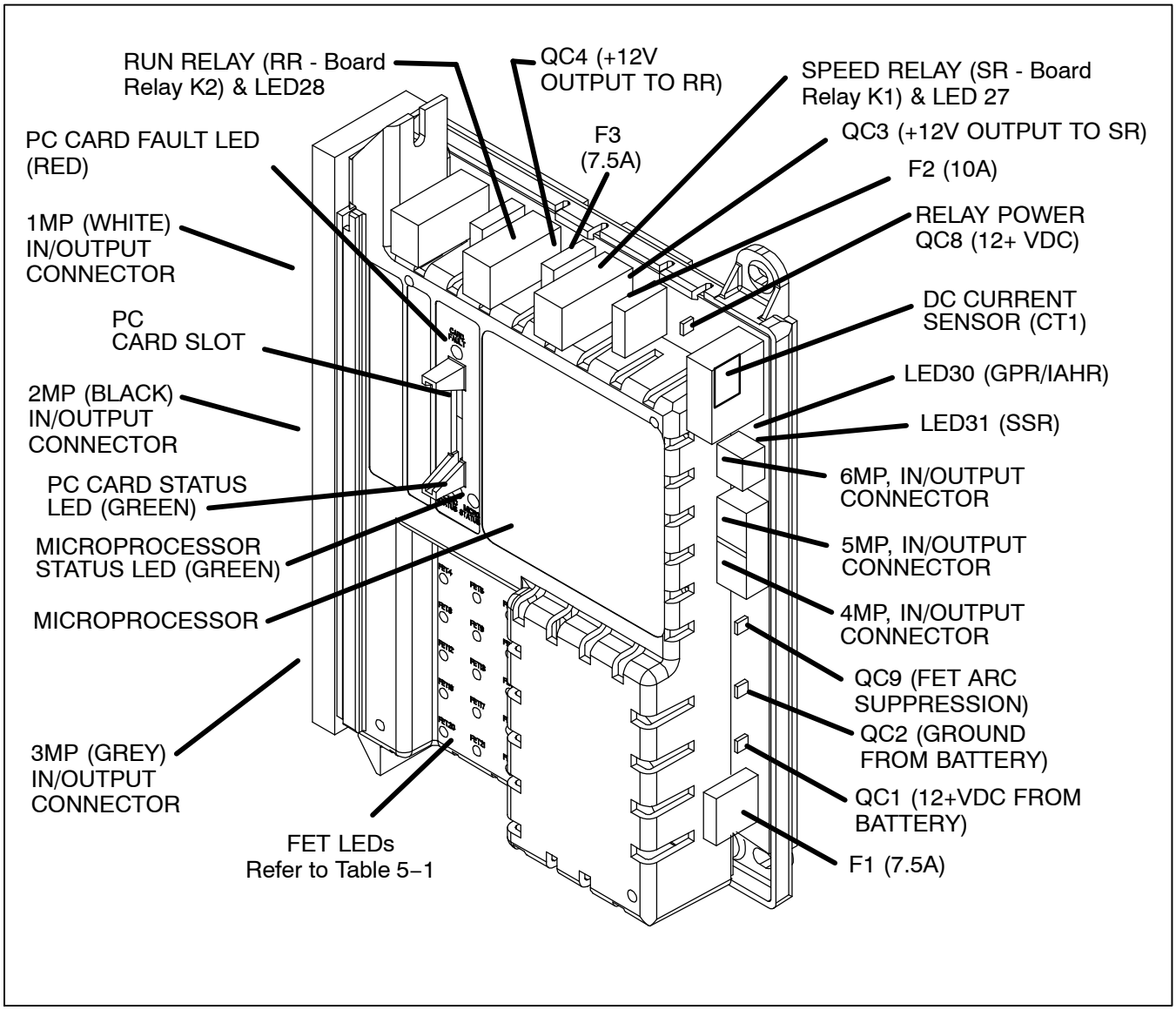
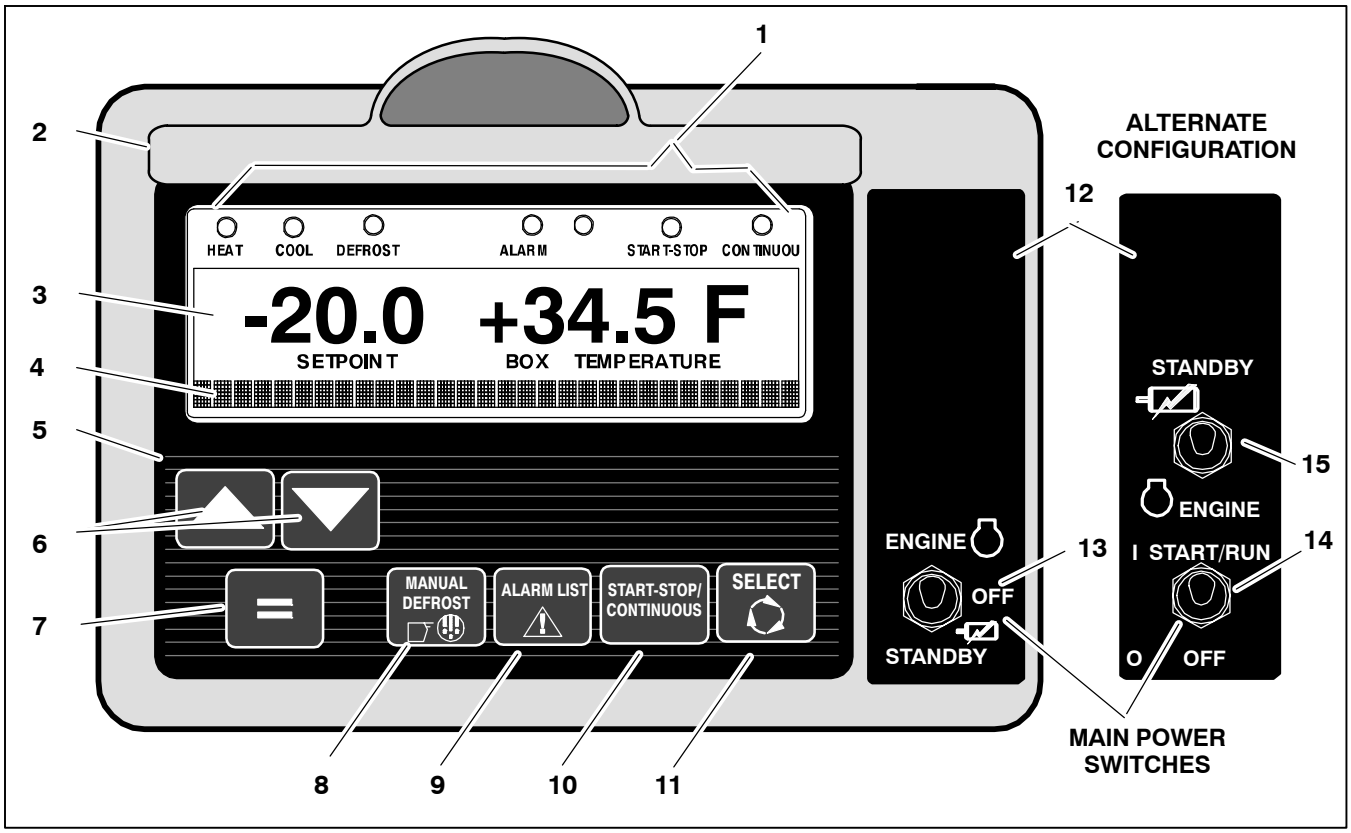

RUN RELAY (RR - Board Relay K2) & LED28
QC4 (+12V OUTPUT TO RR)
SPEED RELAY (SR - Board Relay K1) & LED 27
PC CARD FAULT LED (RED)
F3 (7.5A)
QC3 (+12V OUTPUT TO SR)
F2 (10A)
1MP (WHITE) IN/OUTPUT CONNECTOR
RELAY POWER QC8 (12+ VDC)
PC CARD SLOT
DC CURRENT SENSOR (CT1)
2MP (BLACK) IN/OUTPUT CONNECTOR
LED30 (GPR/IAHR)
LED31 (SSR)
PC CARD STATUS LED (GREEN)
6MP, IN/OUTPUT CONNECTOR
MICROPROCESSOR STATUS LED (GREEN)
5MP, IN/OUTPUT CONNECTOR
MICROPROCESSOR
4MP, IN/OUTPUT CONNECTOR
QC9 (FET ARC SUPPRESSION)
3MP (GREY) IN/OUTPUT CONNECTOR
QC2 (GROUND FROM BATTERY)
QC1 (12+VDC FROM BATTERY)
FET LEDs Refer to Table 5–1
F1 (7.5A)

Figure 2–9 Control Module



1. Indicator lights
2. Keypad Door
3. Main Display
4. MessageCenter
5. Keypad
6. Up and Down Arrow Keys
7. Enter Key
8. Manual Defrost Key
9. Alarm List Key
10. Start/Stop-Continuous Key
11. Select Key
12. Switch Board
    MAIN POWER SWITCHES
13. Diesel/Off/Engine Standby Switch (DOES)
    (Note: switch is labeled ENGINE/OFF/STANDBY)
14. START/RUN - OFF Switch (SROS)
15. Diesel Electric Switch (DES)
    (Note: switch is labeled STANDBY/ENGINE)

Figure 2–10 Display And Keypad Assembly

b. Main Display, MessageCenter & Indicator Lights (see figure Figure 2–10)

Indicator Lights

The display has six LEDs across the top to indicate operational status. These indicators are:

- Heat Indicator (Amber) - Illuminated when the unit is in Heat Mode.
- Cool Indicator (Green) - Illuminated when the unit is in Cool Mode.
- Defrost Indicator (Amber) - Illuminated when the unit is in Defrost Mode.
- Alarm Indicator (Red) - Off or Flashes at a rate of 0.5 seconds.
- Start-Stop Indicator (Green) - Illuminated when Start-Stop Operation has been selected.
- Continuous Indicator (Green) - Illuminated when Continuous Operation has been selected.

NOTE

When the unit is in Null mode (fan only), the mode indicators (cool, heat and defrost) are all off.

NOTE

There is an opening between the Alarm and Start-Stop LEDs that is not used at this time.

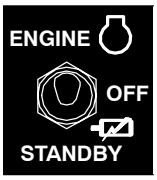
Main Display

The microprocessor will display the refrigerated compartment set point to the left and compartment temperature to the right. Temperatures will be displayed as signed (+ or -). The microprocessor may be configured to display the set point in either whole numbers or with tenths of a degree. The compartment temperature will be followed by a letter indicating the information is in degrees Fahrenheit (F) or degrees Centigrade (C).

Message Center

Messages generated by the microprocessor are displayed in the MessageCenter. As the main display scrolls every 5 to 10 seconds from one active compartment to another, the applicable message for that particular compartment will also be displayed. Details of the messages are described in Section 6.1 MessageCenter.

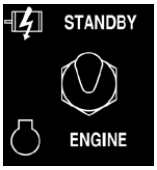
c. Switch Board
Diesel/Off/Engine Standby Switch (DOES)



When placed in the ENGINE or STANDBY position, this switch provides power to the microprocessor. The microprocessor performs a self-test (all segments of display are illuminated). Then setpoint and compartment temperatures are displayed and the unit is started in Engine Operation or Standby Operation.

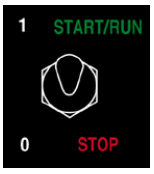
To stop the unit place the DOES switch in the OFF position.

Diesel/Electric Switch (DES) - Alternate Configuration



This switch is used to select either Engine Operation or Standby Operation. When this switch is placed in standby position, the microprocessor will not energize the power source contactors until the engine oil pressure switch (ENOPS) opens.

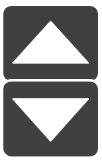
START/RUN-OFF Switch (SROS) - Alternate Configuration



When placed in the START/RUN position, this switch provides power to the microprocessor. The microprocessor performs a self-test (all segments of display are illuminated). Then setpoint and compartment temperatures are displayed.

To stop the unit or remove power from the microprocessor, place the SROS in the OFF position.

d. Keypad



UP ARROW and DOWN ARROW Keys

These keys allow changing of the setpoints or other displayed data of the system. They also allow scrolling through the Unit Data, Function Parameters List, Alarm List, etc.



EQUAL Key (ENTER)

The EQUAL key is used for many things including entering a setpoint, changing a Functional Parameter, clearing alarms, and locking the data menu.



MANUAL DEFROST Key

The MANUAL DEFROST key may be used to initiate a defrost cycle when the required conditions are met.



ALARM LIST Key

The ALARM LIST key allows viewing of the alarms stored in the microprocessor. The alarm list is displayed in the MessageCenter. Pressing the ALARM LIST key once displays the active alarm list. Each successive press advances through the list to the end. To view the inactive alarm list, Refer to Section 3.12.



START-STOP/CONTINUOUS Key

Pressing this key toggles between Start-Stop and Continuous Run operation.



SELECT Key

Press the SELECT key to scroll through the menu selections. One of the five standard menu selections will appear in the MessageCenter when the SELECT key is pressed. Repeated pressing of the SELECT key will sequence the menu through these selections. The menu wraps around. Press the SELECT key until the desired menu selection appears in the MessageCenter.

The selections are:

•**PRESS ↑↓ TO VIEW HOUR METERS**- Displays the hours for individual hour meters. Refer to Section 3.14.

•**PRESS ↑↓ TO START PRETRIP** - Used to initiate a pretrip. Refer to Section 3.4.

•**PRESS ↑↓ TO VIEW DATA** - Displays Unit Data. Refer to Section 3.13.

•**PRESS ↑↓ TO VIEW (AND CHANGE) SETTINGS** - Displays unit Functional Parameter settings. Refer to Section 3.15.

•**PRESS ↑↓ TO MARK TRIP START** - This menu selection is used to record a Trip Start event which is logged in the DataLink data recorder. This records the time and date of the beginning of the trip. Data can then be downloaded and reviewed by trip, making data review much easier. Refer to Section 3.10.

•**PRESS ↑↓ TO VIEW PRINT MENU** - Configures the microprocessor for use with the hand-held Strip Print II printer kit P/N 12-50150-10. Refer to manual 62-90476 (Strip Print) or 62-11338 (Strip Print II).

•**PRESS ↑↓ TO VIEW (AND CHANGE) INTELLISET** - Refer to Section 3.17.

2.6 ELECTRONIC MODULES

2.6.1 Overload Ground Fault Module (OGF)

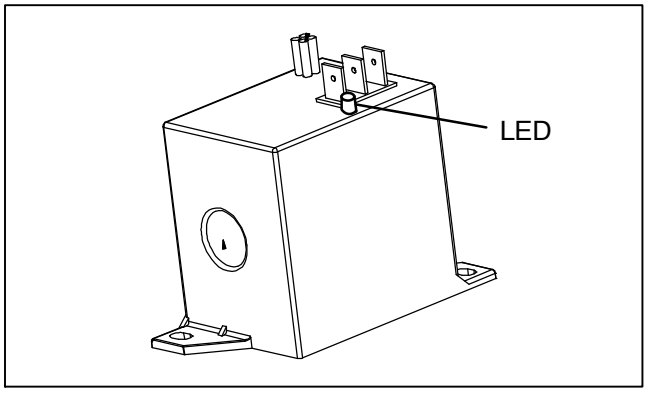


Figure 2–11 OGF Module

The OGF, see Figure 2–11, is located in the control box (see Figure 2–5). The module has two electrical safety features which are active in both Engine and Standby Operation:

1. Overload protection.
2. Ground Fault (Leakage).

In each case, an “A100 - “OVERLOAD GROUND FAULT” alarm is activated and the unit shuts down.

When ground leakage is detected, the red LED on the OGF module will be on continuously.

2.6.2 Phase Reversal Module (PRM)

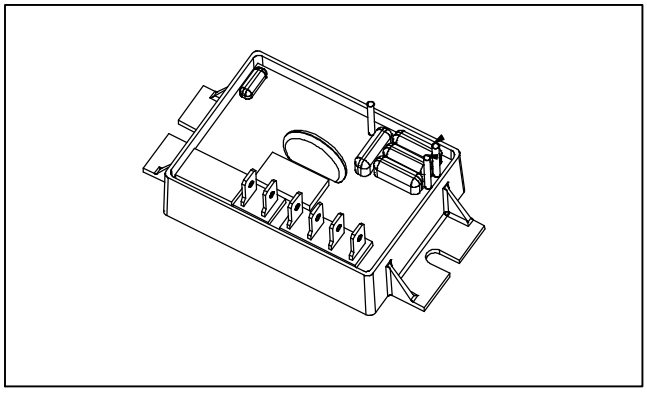


Figure 2–12 PRM Module

The PRM, Figure 2–12, is located in the control box (see Figure 2–5). In Standby Operation, the phase reversal module checks the electrical phase and reverses if necessary.

2.7 OPTIONS

2.7.1 Light Bar

The Light Bar is an external indicator light which can be seen in the driver’s rear view mirror from the cab of the tractor. The green LED indicates “STATUS OK”. The amber LED indicates “CHECK UNIT”. The amber light is illuminated when the microprocessor illuminates the fault light. Alarms can be read on the microprocessor display.

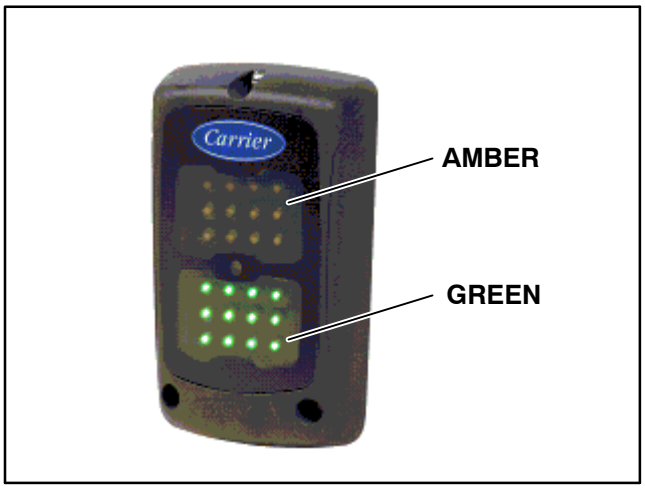


Figure 2–13 Light Bar

2.7.2 Remote Switch(es)

The unit is provisioned to connect remote switches (DS or REMS) directly to the microprocessor.

- Two types of switches may be used:
  1. A switch with contacts that are open when the switch is activated.
  2. A switch with contacts that are closed when the switch is activated.
- Four Configurations are available for each switch.
  1. Activate an alarm only while the switch is activated.
  2. Activate an alarm and shut the unit down while the switch is activated. The unit will remain shut down for a minimum of 3 minutes under this setting.
  3. Activate the alarm and bring the engine into low speed while the switch is activated.
  4. Record the switch activation in the DataLink data recorder.
- If configured to shut the unit down or bring the engine to low speed an additional choice will be available. The additional choice allows the unit to be set so that the configured action will always take place OR the configured action will only take place when the ambient temperature is below a certain temperature. For example, if the shutdown/low speed temperature choice is set to 77°F (25°C) the unit will only shutdown/go to low speed if the ambient temperature is below 77°F (25°C).
- Additionally a Functional Parameter “override” setting will be available for each switch configured to shut the unit down. The Functional Parameter may be set to “YES” or “NO”. If the Parameter is set to “NO” the configured action will not be overridden. If the Parameter is set to “YES”, the alarm will be activated but the unit will not shutdown.

2.7.3 Remote Temperature Sensors

The unit is provisioned to connect up to three remote temperature sensors directly to the microprocessor.

The microprocessor may be configured to display the sensor reading in the Unit Data and to record the sensor reading in the DataLink data recorder. A user specified name may be configured for each sensor. This name will be displayed, rather than the default Remote Sensor #1, Remote Sensor #2 or Remote Sensor #3 name, in the unit data list.

2.7.4 Remote Control Panel

The unit may be fitted with, and the remote switch/door switch configurations set for, an optional remote control panel. The panel displays refrigerated compartment set point, compartment temperature and operating mode (heat, cool or defrost). The set point may be set and the unit may be started and stopped using the remote panel.

This compact panel can be mounted to suit the individual operator's preferences - for example, flush mounted inside the trailer near the rear door. Refer to Section 3.20.2 for more information on the remote control panel.

NOTE

The remote switch/door switch configurations may be set for use as individual switches or for use with a remote panel, not both.

2.8 ENGINE DATA

Engine Model	V2203L-DI-E3B-CTD-5 (26-00128-15)	
Displacement	135 in^3 (2.2 liters)	
No. Cylinders	4	
Rated Power	32 hp (24 KW) @1800 rpm	
NOTE: Refer to Table 2-1 for engine speed settings		
Weight	440 lbs (199.6 kg)	
Coolant Capacity	2 U.S. gallons (7.6 liters) - 50/50 mix ethylene glycol antifreeze (with inhibitors) - never to exceed 60/40 **CAUTION** **Use only ethylene glycol anti-freeze (with inhibitors) in system as glycol by itself will damage the cooling system. Always add pre-mixed 50/50 anti-freeze and water to radiator / engine. Never exceed more than a 60% concentration of anti-freeze. Use a low silicate anti-freeze meeting GM specifications GM 6038M for standard life coolant or use Texaco Havoline extended life coolant or any other extended life coolant which is Dexcool approved and has 5/150 (5 years / 150,000 miles) on the label.**	
Thermostat	Starts to open 177 to 182°F (81 to 83°C). Fully open at 203°F (95°C).	
Fuel System		
Fuel	Winter: Diesel No. 1 Summer: Diesel No. 2(Maximum 5% Bio-Diesel is also allowed)	
Fuel Heater Temperature Switch	Close on a temperature fall @ 45°F (7.2°C) Open on a temperature rise @ 75°F (24°C)	
Firing Order	1-3-4-2	
Intake Air Heater Amperage	42 amps at 12 VDC	
Lubrication System		
Oil Pressure	40 to 62 psig (2.8 To 4.2 Bar) - Engine in high speed	
Oil Pressure Switch (ENOPS)	Closes, on pressure rise, at 18 psig (1.22 Bar) Opens, on pressure fall, at 12 psig (0.82 Bar)	
Oil Capacity with Filter	15 quarts (14.2 liters)	
Lube Oil Viscosity: API CG or better **OR** Mobil Delvac 1	Outdoor Temperature	Grade (SAE)
	Below 32°F (0°C)	10W30 or Mobil Delvac 1 (5W 40)
	Above 32°F (0°C)	10W30 or Mobil Delvac 1 (5W 40) or 15W 40
Oil Change Intervals	Refer to Section 8.2 for information on service intervals.	

2.9 COMPRESSOR DATA

Compressor Model	06D
Number of Cylinders	6
Type	Semi-hermetic Reciprocating
Weight	325 lbs (1478 kg)
Oil Charge	7.6 pints (3.6 liters)
Approved OIl	Mobil Arctic EAL 68

2.10 REFRIGERATION SYSTEM DATA

Defrost Air Switch (DAS)	Initiates Defrost: 1.40 ± .07 inch (35 ± 1.8 mm) WG
Defrost Timer (micro controlled)	1.5h, 3h, 6h, or 12 hours
Evaporator High Temperature Switch (EVHTS)	Opens, on temperature rise, at: 130°± 5°F (55°± 2.8°C) Closes, on temperature fall, at: 100°± 7°F (37.8° ± 3.9°C)
Fusible Plug Melting Point	430°F (221°C)
High Pressure Switch (HP1)	Opens, on pressure rise, at : 465 ± 10 psig (34 ± 0.7 bar) Closes, on pressure fall, at: 350 ± 10 psig (24 ± 0.7 bar)
Unit Dry Weight, Less Battery	2045 pounds (928 KG.)
Battery	50 pounds (23 KG.)

2.11 ELECTRICAL DATA

Compressor Motor	Full Load Amps (FLA)	17.5 amps @ 460 VAC
	Locked Rotor Amps	99.0 amps @ 460 VAC
	Winding Resistance	Approximately 2 ohms, phase to phase
Condenser Fan Motors (Each)	Full Load Amps (FLA)	1.9 amps @ 460 vac, 60 hz
	Horsepower	1.1 hp (820 watts) at 60 hz
	Speed	1700 rpm @ 60 Hz
	Bearing lubrication	Factory lubricated, additional grease not required
	Rotation	Clockwise when viewed from shaft end
	Resistance	20 to 21 ohms
Heaters	**Heater 1**	
	Number of heaters	Three elements (1 assembly)
	Resistance	196 ohms ±10 ohms per phase
	Current, Low Speed	2.6 amps nominal
	Current, High Speed	3.4 amps nominal
	Heater 2	
	Number of heaters	Four elements (1 assembly)
	Resistance	196 ohms ±10 ohms per phase
	Current, Low Speed	2.6 amps nominal
	Current, High Speed	3.4 amps nominal

2.11 ELECTRICAL DATA - Continued

Evaporator Fan Motor	Full Load Amps (FLA)	1.9 amps @ 460 vac, 60 hz
	Horsepower	1.35 hp (1007 watts) @ 60hz
	Speed	3500 rpm @ 60 hz
	Voltage and Frequency	310 to 660 VAC 45 to 65 Hz
	Bearing Lubrication	Factory lubricated, additional grease not required
	Rotation	Clockwise when viewed from shaft end
	Resistance	34.2 to 41.8 ohms
Generator	Nominal voltage & frequency at High Speed	460 VAC, 60 hz, 3 phase
	Nominal voltage & frequency at Low Speed	345 VAC 45 hz, 3 phase
	Resistance	0.73 to 0.778 ohms phase to ground 1.476 to 1.556 phase to phase
	Output	20.7 KVA @ 0.84 p.f @ 1800 rpm
Battery Charger 20 Amp	Input	360 - 460 VAC, Single Phase
	Output amps	20A (Maximum)
	Output voltage	14.8 VDC @ 77°F (25°C)
Battery Charger 40 Amp	Input	360 - 460 VAC, Three Phase
	Output amps	40A
	Output voltage	14.8 VDC @ 77°F (25°C)
OGF Module	Trips - On High Current	40 Amps (Maximum)
	Trips - on Ground Fault	150mA
Battery	Voltage	12 volt nominal - 90 amp hour capacity Cold cranking amps = 425 DIN, 500 IEC, 725 BCI
Standby Power Requirements	Voltage Current	460/3/60 with a 30A Circuit Breaker required. (Full Load Draw = 25A, Locked Rotor Draw = 99A)
Standby Extension Cord	Gauge Length	SOOW, 600V, 90°C, 10/4 (3ph + G) 50’ minimum length, 75’ Maximum length.

2.12 COMPONENT RESISTANCE & CURRENT DRAW DATA

Component	Ohms	Amps
Unloader Solenoid Valve	9.6 ±0.8 Ohms	1.0 - 2.0 Amps
12VDC Relay (IAHR/GPR, SSR, FHR)	72 Ohms ±10%	0.14 - 0.18 Amps
12VDC Relay (PSCONR, GENCONR, CCONR, RCR)	80 Ohms ±15%	0.12 - 0.17 Amps
12VDC Relay (HTCON1, HTCON2, CDCON, 1EVCON)	48 Ohms ±10%	0.25 Amps ±10%
12VDC Relay (PSCON1, PSCON2, GENCON, CCON)	15.5 Ohms ±10%	0.77 Amps ±10%
Fuel/Speed Actuator (FSA)	2.8 Ohms ±10% @ 68°F (20°C)	4 Amps Max
Intake Air Heater Circuit	0.3 to 0.5 Ohms	38 - 46 Amps
Starter Motor	Less than 1 Ohm but more than 0	270 - 380 amps
Fuel Heater	1.4 Ohms ±10%	10.7 amps ±10%

2.13 SAFETY DEVICES

The system is protected from high pressure conditions which may occur when exposed to very high temperatures (such as a fire) by a fusible plug mounted in the receiver. Under very high temperature conditions (refer to Section 2.10) the plug will melt, releasing the refrigerant pressure.

System components are protected from damage caused by unsafe operating conditions by automatic shut-down of the unit when such conditions occur. This is accomplished by the safety devices listed in the following table.

Unsafe Conditions	Safety Device	Device Setting
Excessive operating pressure	High Pressure Switch (HPS)	Refer to Section 2.10
Excessive current draw by microprocessor	Fuse (F1)	Opens at 7.5 amps
Excessive current draw by speed relay	Fuse (F2)	Opens at 10 amps
Excessive current draw by run relay	Fuse (F3)	Opens at 7.5 amps
Excessive current draw by battery output	Fuse (F5)	Opens at 80 amps
Excessive current draw by control circuit	Fuse (F6)	Opens at 15 amps
Excessive current draw by battery charger input - 20 amp charger.	Fuse (F7, F8)	Opens at 3 amps (single charger) **OR** opens at 6amps (dual chargers) See note.
Excessive current draw by battery charger input - 40 amp charger(s).	Fuse (F7, F8, F29)	Opens at 5 amps (timed)
Excessive current draw by generator/power supply contactors	Fuse (F9)	Opens at 10 amps
Excessive current draw by evaporator heaters	Fuse (F10/F11/12)	Opens at 12 amps
Excessive current draw by fuel heater circuit	Fuse (F19)	Opens at 20 amps
Excessive current draw by fuel level sensor circuit	Fuse (FLS)	Opens at 3 amps
Excessive current draw by evaporator or condenser fan motor	Fuse (F26/F27/F28)	Opens at 12 amps
Excessive condenser fan motor winding temperature	Internal protector	Auto reset
Excessive compressor motor winding temperature	Internal protector	Auto reset
Excessive evaporator motor winding temperature	Internal protector	Auto reset

NOTE: When a second 20 amp rated charger is used to charge a lift gate battery, the higher rated fuse is installed

2.14 REFRIGERANT CIRCUIT DURING COOLING

When cooling, (See Figure 2−14) the unit operates as a vapor compression refrigeration system. The main components of the system are: the (1) reciprocating compressor, (2) air-cooled condenser, (3) expansion valves, and (4) direct expansion evaporator.

The compressor raises the pressure and the temperature of the refrigerant and forces it into the condenser channels. The condenser fans circulate surrounding air over the outside of the channels. The channels have fins designed to improve the transfer of heat from the refrigerant gas to the air. This removal of heat causes the refrigerant to liquify. Liquid refrigerant leaves the condenser and flows to the receiver.

The receiver stores the additional charge necessary for low ambient operation. The receiver is equipped with a fusible plug which melts on occurrence of very high temperature to relieve the refrigerant pressure.

The refrigerant leaves the receiver and flows through the liquid line service valve to the subcooler. The subcooler occupies a portion of the main condensing coil surface and gives off further heat to the passing air.

The refrigerant then flows through a filter-drier where an absorbent keeps the refrigerant clean and dry.

The refrigerant flows to the suction line heat exchanger. Here the liquid is further reduced in temperature by giving off some of its heat to the suction gas.

The liquid then flows to an electronic expansion valve which reduces the pressure of the liquid and meters the flow of liquid refrigerant to the evaporator to obtain maximum use of the evaporator heat transfer surface.

The refrigerant pressure drop caused by the expansion valve is accompanied by a drop in temperature so the low pressure, low temperature fluid that flows into the evaporator tubes is colder than the air that is circulated over the tubes by the evaporator fan. The evaporator tubes have aluminum fins to increase heat transfer; therefore heat is removed from the air circulated over the evaporator. This cold air is circulated throughout the refrigerated compartment to maintain the cargo at the desired temperature.

The transfer of heat from the air to the low temperature liquid refrigerant causes the liquid to vaporize.

This low temperature, low pressure vapor passes through the evaporator outlet. The vapor then passes through the heat exchanger where it absorbs more heat from the high pressure / high temperature liquid and then returns to the compressor through the compressor suction modulation valve (CSMV). The CSMV controls the compressor suction pressure thereby matching the compressor capacity to the load.

2.15 REFRIGERANT CIRCUIT - HEATING AND DEFROSTING

The compressor is turned off for all heating and defrost cycles. In heat, the coil mounted heaters and evaporator fan(s) are energized. Air flowing over the warm heater elements is circulated through the compartment to maintain the cargo at the desired temperature. Defrost may be accomplished using either electric heaters or return air (refer to Section 4.6).

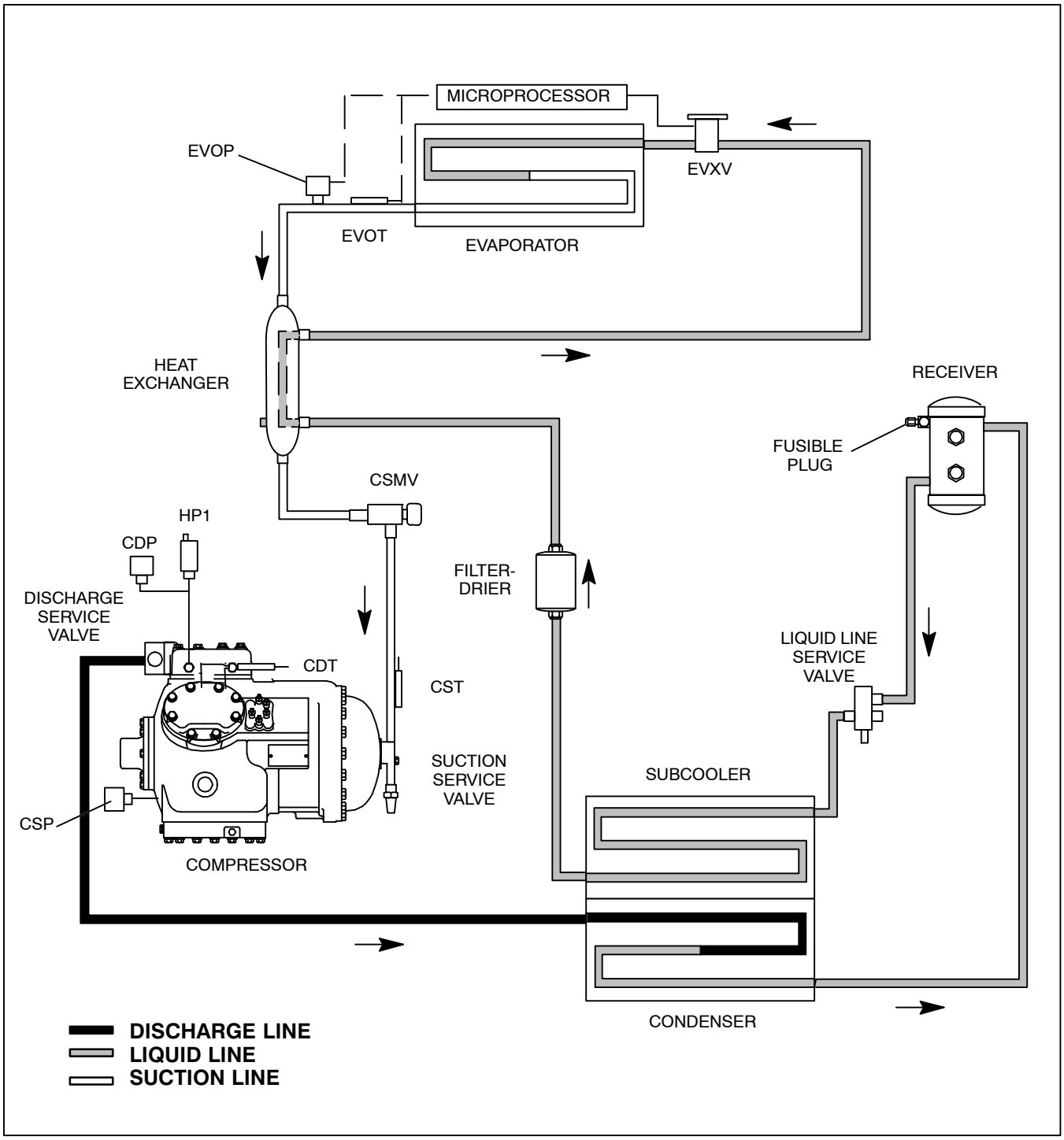


Figure 2–14 Refrigerant Circuit

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SECTION 3
OPERATION

3.1 STARTING - ENGINE OPERATION

⚠ WARNING

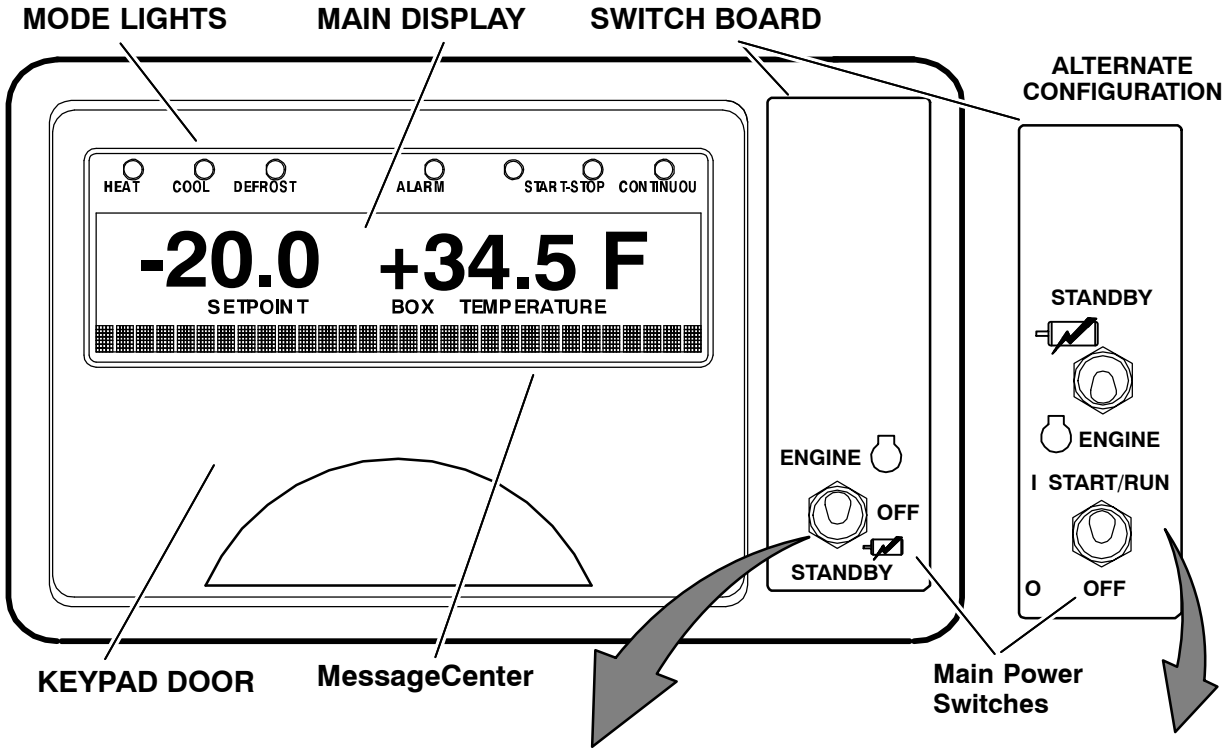
Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.

⚠ WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the Main Power Switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.

⚠ WARNING

Under no circumstances should ether or any other starting aids be used to start engine.



UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF-STANDBY

1. Place the Main Power switch in the ENGINE position.
2. The microprocessor will perform a Self Test (refer to Section 3.3) and then start the unit automatically.

UNITS WITH A MAIN POWER SWITCH LABELED START/RUN-OFF

1. Place the Main Power switch in the ENGINE position. Then place the switch labeled START/RUN-OFF in the START/RUN position.
2. The microprocessor will perform a Self Test (refer to Section 3.3) and then start the unit automatically.

3.2 STARTING - STANDBY OPERATION

WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the Main Power Switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.

WARNING

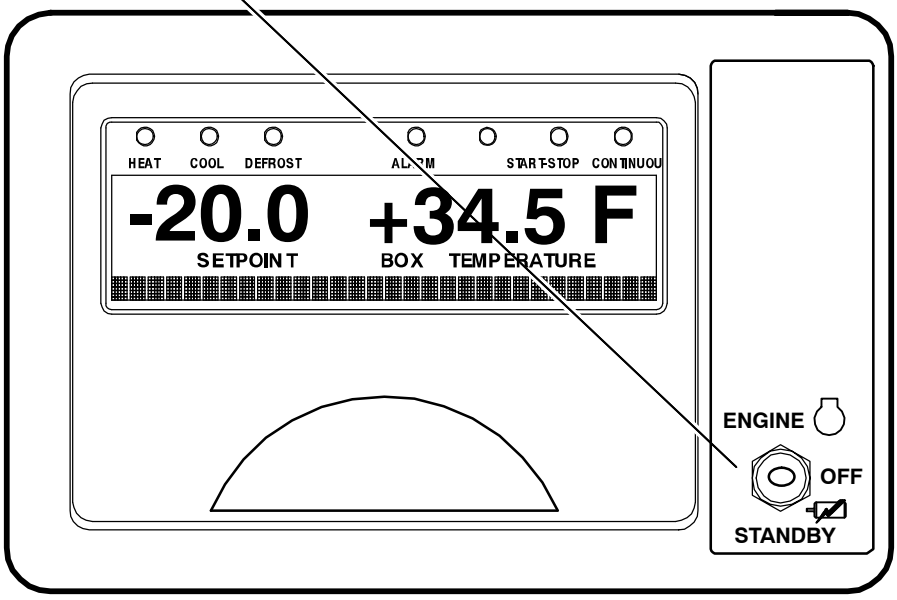
Ensure the power plug is clean and dry before connecting to any electrical outlet / receptacle.

WARNING

Do not connect power plug to any electrical outlet without checking that it meets the 460/3/ 60 and 30 Amp electrical requirements of the unit.

Starting units with a Main Power switch labeled ENGINE/OFF/STANDBY.

1. Ensure the switch labeled ENGINE/OFF/ STANDBY is in the OFF position.
2. Ensure the external power circuit breaker is off, connect standby cable to unit and then turn the external power circuit breaker on.



3. Place the switch labeled ENGINE/ OFF/STANDBY in the STANDBY position.

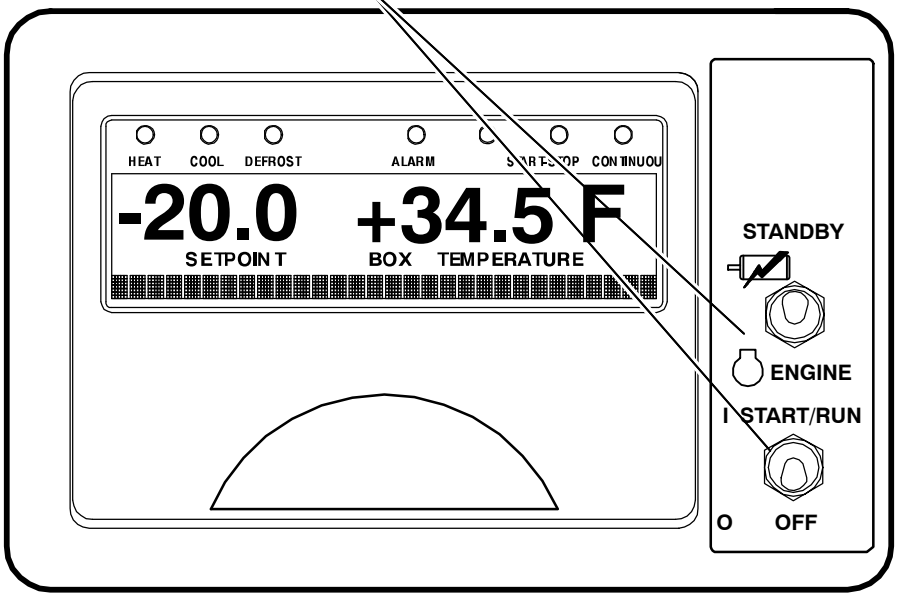


4. The unit will then perform a Self Test (refer to section 3.3) and start the unit automatically.

Starting units with a Main Power switch labeled START/RUN-OFF.

1. Ensure the switch labeled ENGINE/STANDBY is in the STANDBY position and the switch labeled START/RUN-OFF is in the OFF position

2. Ensure the external power circuit breaker is off, connect standby cable to unit and then turn the external power circuit breaker on.



3. Place the switch labeled START / RUN - OFF in the START/RUN position.



4. The unit will then perform a Self Test (refer to section 3.3) and start the unit automatically.

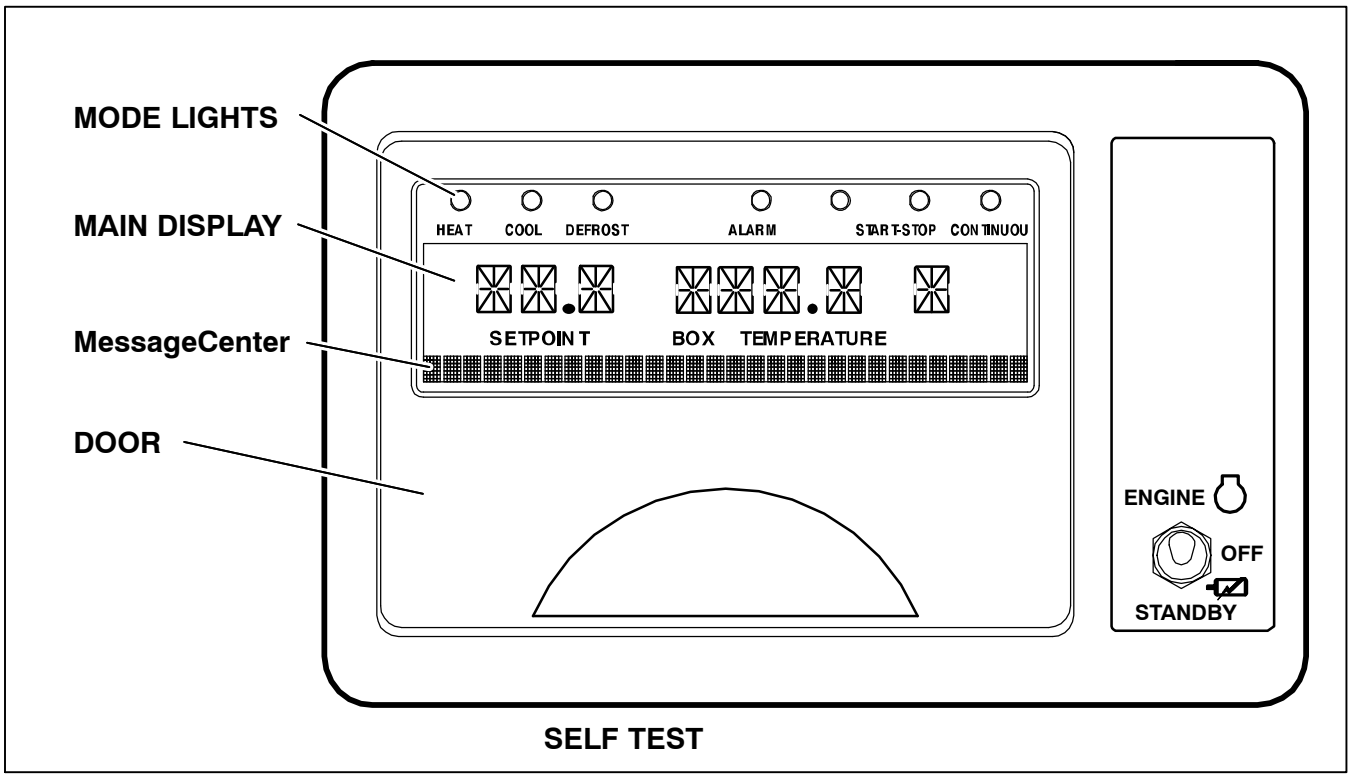
NOTE

The unit is equipped with automatic phase reversal which ensures that the electric motors will run in the correct direction.

For safe, reliable operation in Standby Operation, it is important to consider the following guidelines:

- **NEVER** connect the unit to a high voltage power source unless the Main Power Switch is in the OFF position.
- The power supply cable and circuit breaker must comply with local electrical code and unit specifications. Refer to section 2.11.
- The power supply cable must be equipped with a ground connection.
- Repairs or maintenance to the supply voltage circuit should only be performed by licensed / authorized personnel.

3.3 SELF TEST



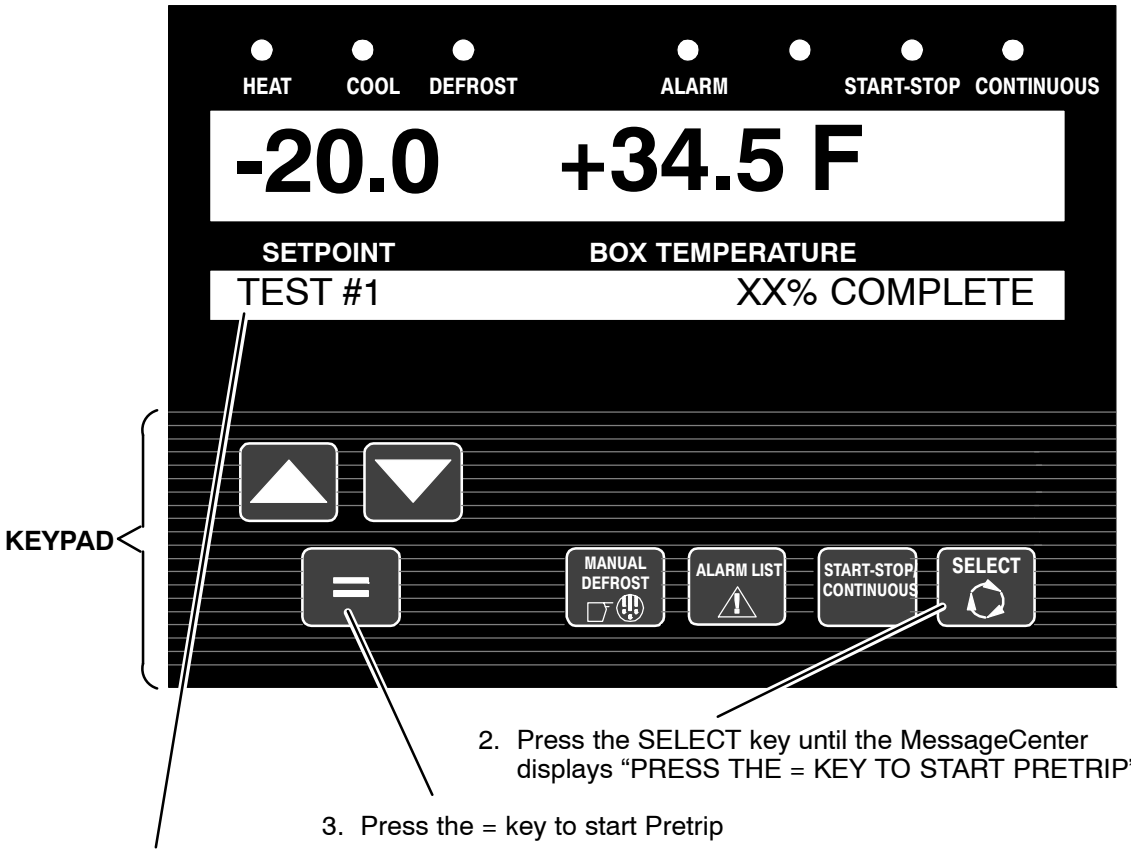
SELF TEST

When first powered up, the microprocessor will run a self test consisting of the following steps:

- All of the mode lights will illuminate.
- All of the segments on the main display will turn on.
- All of the liquid crystal diodes (LCDs) of the MessageCenter will turn on to verify their operation.
- The main display will then display the set point temperature in the left characters and a compartment (BOX) temperature in the right characters. The character just to the right of the box temperature indicates the temperature units as “C” Centigrade or “F” Fahrenheit.
- The MessageCenter will then display “MICRO SELF TEST IN PROGRESS” for several seconds.
- If one or more Inactive alarms are stored, “INACTIVE ALARMS IN MEMORY” will be displayed and the Alarm LED will flash for 5 seconds, then turn off. Refer to Section 3.12 for information on viewing inactive alarms.
- If the IntelliSet option has been installed the name of the current IntelliSet or “INTELLISET OFF” will be displayed. Refer to Section 3.17 for IntelliSet information.
- If the microprocessor has been configured to display the hour meters, the Total Engine Hours, Standby Run Hours and/or Total Switch On Hours will be displayed.
- If there are one or more active alarms, the MessageCenter will display “UNIT SHUTDOWN - SEE ALARM LIST”. Any active alarms must be corrected and cleared before the unit can start. Refer to Section 3.11 for information on active alarms.
- The microprocessor will then display “SMV CLOSING” while the CSMV and the EVXV are brought to unit starting positions.
- **In engine operation**, the intake air heater will energize (as required), the buzzer will sound, and the engine will start.
- **In standby operation**, the buzzer will sound then the fans and compressor will start.

3.4 PRETRIP

1. Place the switch labeled ENGINE/OFF/STANDBY in the desired position OR place the switch labeled START/RUN-OFF in the START/RUN position.



2. Press the SELECT key until the MessageCenter displays “PRESS THE = KEY TO START PRETRIP” .
3. Press the = key to start Pretrip
4. Verify that during TEST#1 the complete display is turned on and that all lights on the Light Bar come on. Verify during Test #2 that the that the buzzer comes on for the first five seconds.
5. The remainder of Pretrip will take 7 to 15 minutes, and will run itself automatically.

Pretrip is a set of tests run by the microprocessor to check unit operation. It is recommended that a Pretrip be run prior to loading the trailer. It will indicate a failure when one is detected.

TIP

A Pretrip can be started at any box temperature. If Pretrip is started while the unit is in a Start-Stop off cycle the unit will start during the course of the test. If the unit is running when Pretrip is started, it will shutdown for the first three tests.

TIP

It is always a good idea to clear all alarms from both Alarm Lists before starting Pretrip. The technician will then know that any alarms present following Pretrip occurred during Pretrip, and are not old alarms that had not been cleared.

During the Pretrip test, the MessageCenter displays the current test number and description and the % of the test that has been completed. When Pretrip is complete the MessageCenter will display one of three different messages:

- “PRETRIP PASS” **OR**
- “PRETRIP FAIL IN TEST X” **OR**
- “PRETRIP FAILED & COMPLETE”. Alarm light will be on.

Press the ALARM LIST key to review the alarms triggered by the Pretrip tests.

TIP

The Pretrip test “PASS” of “FAIL” results message will stay displayed until any key is pressed, or until the Main Power Switch is placed in the OFF position.

Once Pretrip is started, the control panel keys are disabled until Pretrip is completed.

TIP

If “CAN NOT START PRETRIP” is displayed in the MessageCenter, check to see if the unit is in PC Mode (Refer to Section 5.3) or Defrost mode, or check the alarm list (Section 3.11) for active shutdown alarms.

NOTE

Pretrip will run until completed, unless an alarm occurs that causes Pretrip to be aborted. Only alarms that will result in other erroneous alarms or will affect future Pretrip tests will abort Pretrip.

TIP

Pretrip may be stopped by the user by either turning the unit off then back on again, or by pressing and holding the = key for 5 seconds. “PRETRIP STOPPED BY USER” will display in the MessageCenter.

Once Pretrip is started: If the unit is running, the microprocessor will shut the unit down.

NOTE

Before completing Pretrip, the microprocessor looks at the status of alarms and if certain alarms are active (for example: Low Fuel Warning, Check Engine Oil Level, Check Coolant Level, Check Coolant Temperature, Pretrip will display “FAILED”, indicating that the unit is not ready to be sent out for a load, but that the alarm list should be checked and all present alarm situations corrected.

TIP

It is always a good idea to clear all alarms from both Alarm Lists before starting Pretrip. The technician will then know that any alarms present following Pretrip occurred during Pretrip, and are not old alarms that had not been cleared.

NOTE

The operator MUST be present and validate Test 1 by watching the microprocessor display. The microprocessor will illuminate all the Mode Lights and all segments of the Main Display. Following Test 1, the operator MUST verify that, during the first 5 seconds of Test 2, the buzzer is energized.

Test 1 - Display Test

The microprocessor activates the display, and both lights on the Light Bar. This test will last 5 seconds. All segments of the display, all LEDs on the microprocessor, both lights of the Light Bar will be on during this test. This portion of the Pretrip requires that the operator determines PASS or FAIL. A defective display is indicated if: any LCD/LED segments are not visible or any LEDs or lights do not illuminate. Anything that fails during this test should be repaired at the conclusion of the Pretrip cycle. Pretrip will continue regardless of the outcome of this test. A faulty display or light bar will not affect the operation of the unit, but will affect what is displayed during unit operation.

Test 2 - Sound and 12VDC Electrical Component Amperage Check

At the beginning of this test the microprocessor activates the buzzer for 5 seconds, the operator is to determine if the sound test is PASS or FAIL. If the sound test fails it should be repaired at the conclusion of the Pretrip cycle. Pretrip will continue regardless of the outcome of the sound test. A faulty buzzer will not affect the operation of the unit, but will lead to operation without proper audible warning on start up.

Test 2 will continue with a check of the amperage (current) draw of the following components:

- Battery DC Current (All Components Turned Off).
- Front Unloader Solenoid (UL1).
- Rear Unloader Solenoid (UL2) .
- Intake Air Heater (IAH).
- Engine Speed Control Unit (ENSCU).
- Condenser Motor Contactor (CDCON).
- Compressor Motor Contactor (CCON).
- Generator Contactor (GENCON).
- Standby Contactor (PSCON).
- Heater Contactor (1HTCON1).
- Heater Contactor (1HTCON2).
- Evaporator Motor Contactor (1EVCON).

Each component will be individually checked for proper current draw. An alarm will be activated for any component not drawing amperage in the expected range.

Test 3 - Refrigeration System Equalization Check

With the engine and the unit off, the CSMV will open to 50% and the EVXV will open to 100% so that the pressure in the refrigeration system can equalize.

Test 4 will last approximately 5 seconds. If a problem is detected with any of the sensors, the corresponding alarm will be activated.

PRETRIP (Continued)

Test 4 - Temperature Sensor Check

Check the condition of all of the system temperature sensors.

NOTE

Tests 5, 6 an 7 are only performed when unit is in Engine Operation. When in Standby Operation, pretrip will skip to Test 8.

Test 5 - Engine Low Speed

The engine starts up in low speed with condenser fans on. The microprocessor verifies that engine speed is in low speed range. If the engine is not operating within the low speed range, the P174 -"CHECK LOW SPEED RPM" alarm will be activated.

Test 6 - Engine High Speed

The engine switches to high speed and energizes HTCON1 and HTCON2. The microprocessor verifies that engine speed is in high speed range. If the engine is not operating within the high speed range, the P175 - "CHECK HIGH SPEED RPM" alarm will be activated.

Test 7 - Engine Low Speed 2

The engine switches back to low speed and heaters turn off. The microprocessor verifies that engine speed is in low speed range. If the engine is not operating within the low speed range, the P174 - "CHECK LOW SPEED RPM" alarm will be activated.

Test 8 - Electric Heater Amperage Check

Each heater will be energized individually and checked for proper current draw. An alarm will be activated for any heater not drawing amperage in the expected range.

Test 9 - Evaporator Fan Motor Amperage Check

The evaporator motor contactor will be energized and checked for proper current draw. An alarm will be activated if the evaporator fan motor is not drawing amperage in the expected range.

Test 10 - Condenser Fan Motors Amperage Check

The condenser fan motor contactor will be energized and checked for proper current draw. An alarm will be activated if the condenser fan motors are not drawing amperage in the expected range.

Test 11 - Check Compressor Suction Modulation Valve (CSMV)

This test ensures that the CSMV is opening and closing properly. If suction pressure doesn't change as expected with CSMV closed then the P180 - "CHECK SUCTION MOD VALVE" alarm will be activated. This test may take several minutes.

Test 12 - Electronic Expansion Valve (EVXV)

This test checks the operation of the EVXV. If valve doesn't test properly the P177 - "CHECK EVAP SUPERHEAT" alarm will be activated.

Test 13 - Unloaders

This test checks the operation of the unloaders. If suction and discharge pressures do not change when UL1 and UL2 are energized and de-energized, the P178 - "CHECK UL1" or P191 - "CHECK UL2" alarm will be activated.

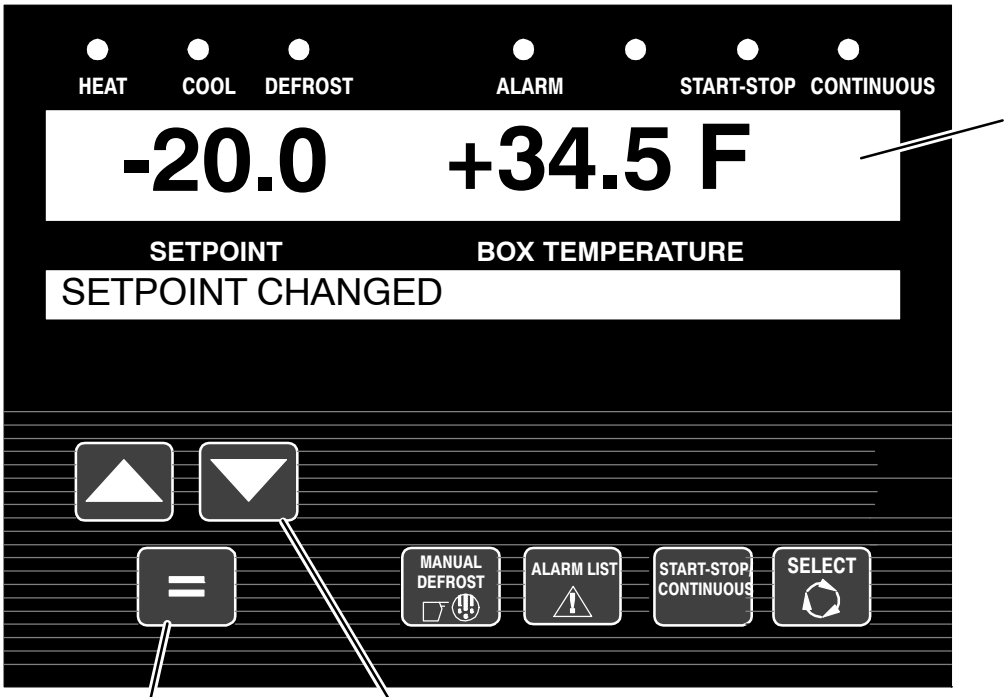
Test 15 - Check For Other Alarms

The alarm list is checked for any non-pretrip alarms that may have occurred during the Pretrip test. If any operational alarms occurred, Pretrip will display FAIL, and the technician will need to review the Alarm List and take necessary and appropriate action to clear them. Test 15 will last about five seconds.

Pretrip Termination

When the Pretrip cycle is completed, the unit will return to normal temperature control operation. "PRETRIP PASS" will be displayed until the operator presses any key. In the event that the Pretrip test triggered an alarm(s), either "PRETRIP FAIL & COMPLETE" (if the entire Pretrip cycle was completed), or "PRETRIP FAIL IN TEST XX", (if the Pretrip cycle was aborted by an alarm before it was completed) will be displayed.

3.5 CHANGING SET POINT



1. Press the UP ARROW or DOWN ARROW key to change the set point to the desired value. The MessageCenter will display "↑↓ TO SCROLL, THEN = TO SAVE".

2. Press the = key to save the new set point.

By default, set points of -22°F to +89°F (-30°C to +32°C) may be entered via the keypad. The microprocessor always retains the last entered set points in memory. The set points will change 1° (one full degree) **OR** 0.1° (one tenth of a degree - if configured to do so) for each press and release of the UP ARROW or DOWN ARROW key.

NOTES

The microprocessor may be configured with a minimum and/or maximum set point other than the default values listed above. "MAX SETPOINT HAS BEEN REACHED" or "MIN SETPOINT HAS BEEN REACHED" will display in the MessageCenter when either of these conditions is reached.

Set point may be changed any time the Main Power switch is not in the OFF position, or when the unit is in PC Mode EXCEPT when:

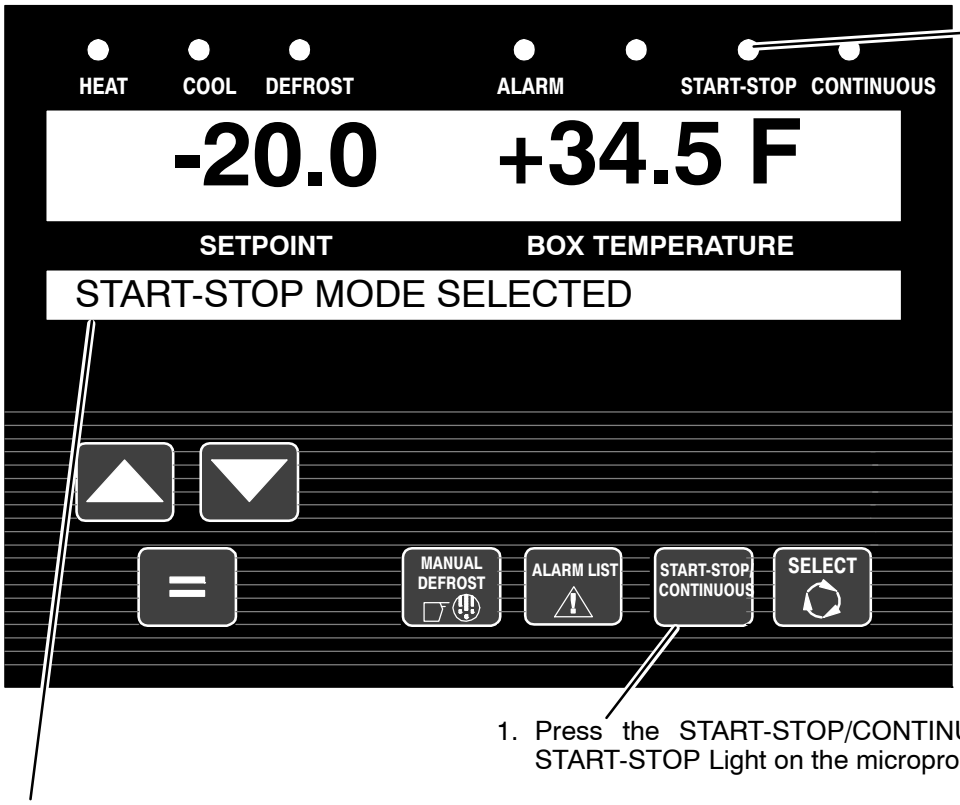
- Viewing the Alarm List, Data List or Functional Parameters **OR**
- When the unit is in Pretrip **OR**
- When the unit is in Sleep Mode.

Pressing the = key will cause the new displayed set point value to become active and "SETPOINT CHANGED" will be displayed. If the new value is not entered, after 5 seconds of no keypad activity, the entire display and Light Bar will flash and the buzzer will be energized for 15 seconds (with "SETPOINT NOT CHANGED" displayed) and then revert back to the last entered set point. All other keys are active at this time and if pressed while the display is flashing, will stop the flashing, and perform the requested function.

TIP

The set point may be changed quickly by pressing and holding the UP ARROW or DOWN ARROW key. The longer the key is held, the faster the setting will change.

3.6 START-STOP OPERATION



1. Press the START-STOP/CONTINUOUS key until the START-STOP Light on the microprocessor illuminates.
2. Verify that “START-STOP MODE SELECTED” is displayed on the MessageCenter and that the START-STOP light is illuminated. The unit is now in Start-Stop operation.

Start-Stop is provided to reduce fuel or power consumption. This feature allows full automatic control of the unit shutdown and restart by monitoring refrigerated compartment temperature, battery charging amps and engine coolant temperature (Engine Operation only). The main function of Start-Stop Operation is to turn off the refrigeration system near setpoint to provide an efficient temperature control system and to initiate a restart sequence after certain conditions are met. The Start-Stop/Continuous key is pressed to select between Continuous Run and Start-Stop Operation. The corresponding LED will be iluminated.

The microprocessor may be configured with Start-Stop operation tied to the set point ranges for frozen and perishable loads. The Start-Stop/Continuous key is locked out if “START-STOP LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Start-Stop Operation or “CONTINUOUS LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Continuous Run Operation. Refer to Section 5.2.1 for Configuration information.

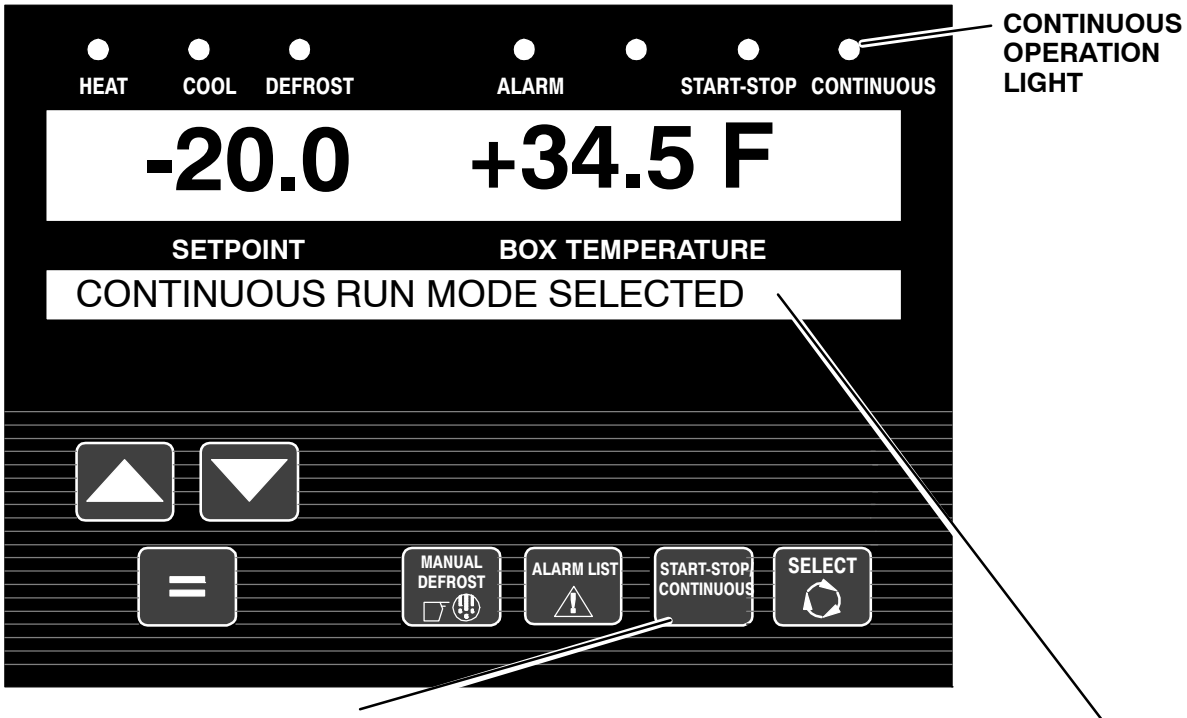
If the unit fails to start after three start attempts, the A31 - “FAILED TO START-AUTO” alarm will be activated. While running, if the unit shuts down, an internal counter keeps track of the shutdowns. Should the unit shutdown three consecutive times without running a minimum of 15 minutes between shutdowns, the A30 - “FAILED TO RUN MINIMUM TIME” alarm will be activated. The shutdown counter is cleared when the unit has run for 15 minutes.

NOTE

In Standby Operation, the unit will stop for a minimum of 5 minutes instead of 15 minutes.

Refer to Section 4.4 for more detailed information on Start-Stop Operation.

3.7 CONTINUOUS OPERATION



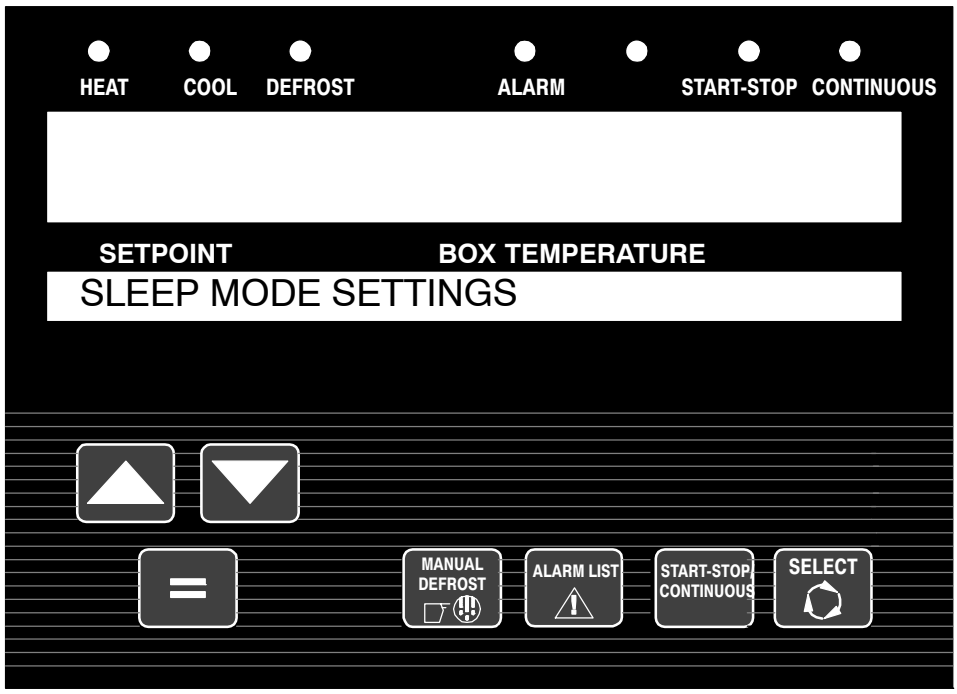
1. Press the START-STOP/CONTINUOUS key until the CONTINUOUS OPERATION Light on the microprocessor illuminates.
2. Verify that “CONTINUOUS RUN MODE SELECTED” is displayed on the MessageCenter and that the CONTINUOUS OPERATION light is illuminated. The unit is now in Continuous Operation.

In Continuous Operation, the unit will not shutdown except in response to a shutdown alarm. Refer to Section 4.5 for more detailed information on Continuous Operation.

The microprocessor may be configured with Start-Stop operation tied to the set point ranges for frozen and perishable loads. The START-STOP/CONTINUOUS key is locked out if “START-STOP LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Start-Stop Operation or “CONTINUOUS LOCKED” displays in the MessageCenter when the key is pressed and the unit is in Continuous Operation. Refer to Table 5–2 for more information on Configurations.

If the unit fails to start after three start attempts the A 31 - “FAILED TO START-AUTO” alarm will be activated. While running, if the unit shuts down, an internal counter keeps track of the shutdowns. Should the unit shutdown three consecutive times without running a minimum of 15 minutes between shutdowns the A30 - “FAILED TO RUN MINIMUM TIME” alarm will be activated. The shutdown counter is cleared when the unit has run for 15 minutes.

3.8 SLEEP MODE



Entering using Functional Parameter settings:

1. Press the SELECT key until the MessageCenter displays “PRESS ↑↓ TO VIEW SETTINGS”.
2. Press the UP ARROW key until the Functional Parameter “SLEEP MODE SETTINGS” is displayed. Press the = key. The MessageCenter will then display “↑↓ TO SCROLL, THEN = TO SAVE”.
3. Press either the UP or DOWN ARROW key until “SLEEP MODE: YES” is displayed. The MessageCenter will flash, indicating that this change has not been entered into memory. Press the = key to save the setting ti memory - the MessageCenter will stop flashing, the unit is now in sleep mode.
4. Additional Functional Parameter sub menu selections for “wake up time” and “run pretrip at wake” will now be available and may be saved to memory following the key stroke sequence in the preceding step. Refer to the following paragraphs for information on these settings.

TO EXIT SLEEP MODE

Place the Main Power switch in the OFF position, then back to the desired position.

Sleep Mode is generally used in cold ambients when the unit will be off for an extended period of time with no product inside the refrigerated compartment. Many times units are difficult to start due to a discharged battery, thickened engine oil, etc. after time in cold ambient.

There is **NO TEMPERATURE CONTROL** in Sleep Mode and it should never be used if the compartment contains perishable or frozen products.

In Sleep Mode and Engine Operation the unit will “Wake Up” periodically and start the engine to keep the battery charged and the engine warm.

In Sleep and Standby Mode if the unit is connected to standby power, the battery charger is energized and will keep the battery charged. The engine will not run with the switch in the STANDBY position.

ADDITIONAL SUB MENUS

1. “WAKE UP TIME”

   a. When “WAKE UP TIME” is set to NO the unit will remain in Sleep Mode until it is taken out manually (refer to “TO EXIT SLEEP MODE” instruction above).

   b. When “WAKE UP TIME” is set to YES the “SET WAKEUP TIME” menu will become available.

Pressing the = key will allow the user to select the date and time the unit is to automatically wake up. The wake up time must be at least 1 hour and no more than 8 days from the time the clock is set. The following information can be entered:

- Month (1 to 12).
- Day (1 to 31).
- Year (1998 to 2037).
- Hour (0 to 23).
- Minute (0 to 59).

NOTE

The clock is a 24 hour clock. Hours 1 thru 12 are AM and hours 13 thru 24 are PM.

2."RUN PRETRIP TEST AT WAKE"

a. When "PRETRIP TEST AT WAKE" is set to NO the unit will wake up at the designated time and control to set point.

b. When "PRETRIP TEST AT WAKE" is set to YES. the unit will wake up at the designated time, automatically run Pretrip and then control to set point. "PRETRIP PASS/FAIL" will remain in the MessageCenter until it is manually cleared.

If Sleep Mode is selected with the switch in the ENGINE position, when the unit is not running during a Start-Stop Off Cycle, any remaining Minimum Off Time will be ignored, and the engine will start. It will run for 4 minutes (minimum), until the engine coolant temperature is above 50°C (122°F), and the battery is fully charged (O.K. displays in the Data List voltage line, and charging amps are less than the configured setting). While the unit is running in Sleep Mode, "SLEEP WARNING: NO TEMP CONTROL" will flash in the MessageCenter, and the main display (set point and compartment temperatures) will be off.

If the unit is already running when Sleep Mode is selected, it will continue to run until the conditions described above are met.

While the unit is cycled off in Sleep Mode, "SLEEP MODE, OFF/ON TO WAKE" will be displayed in the MessageCenter. The display backlight will turn off after 5 minutes.

While in Sleep Mode, Unit Data and Alarm Lists may be viewed, and Functional Parameters may be viewed and changed as necessary. However, Start-Stop/Continuous Run selections and set point can not be changed. Manual Defrost and Pretrip can be initiated.

The unit will restart when engine coolant temperature drops below the configured restart temperature value or if the battery voltage drops below the configured battery restart value. (refer to Table 5–2)

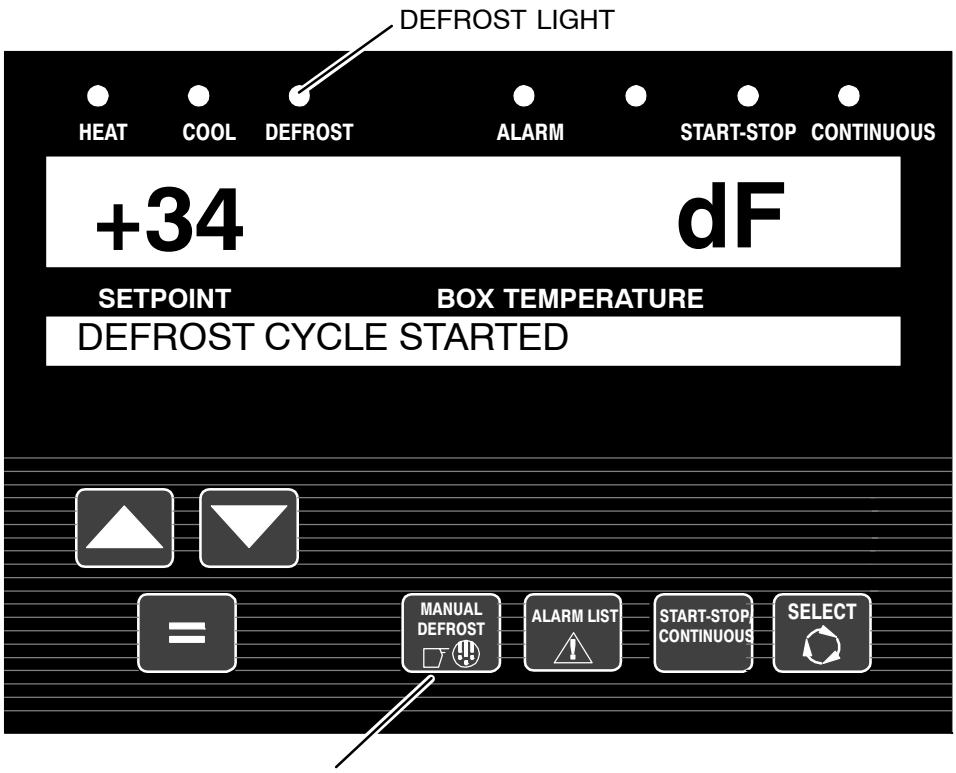
NOTE (FOR ENGINE OPERATION ONLY)

In the event that the Engine Coolant Temperature sensor fails, Sleep Mode will operate as follows:

In ambients above 32°F (0°C), the unit will run as above, and will monitor battery voltage and charging amps only (according to the Configuration setting).

In ambients below 32°F (0°C), the unit will run for 20 minutes minimum run time, then restart every 60 minutes (maximum off time). Battery voltage and amperage will be monitored normally.

3.9 MANUAL DEFROST



Press the MANUAL DEFROST key. The DEFROST light will come on and the MessageCenter will display “DEFROST CYCLE STARTED” for 5 seconds, or flash “CANNOT START DEFROST CYCLE” for five seconds.

When defrost mode cannot be manually initiated “CANNOT START DEFROST CYCLE” is displayed in the MessageCenter. This will occur when:

- DTT is above 40°F (4°C). Defrost may be entered any time the DTT is below 40°F (4°C) **OR**
- The engine has not run 15 seconds after starting **OR**
- The unit is in PC Mode **OR**
- The unit is in Pretrip **OR**
- There is an active shutdown Alarm.

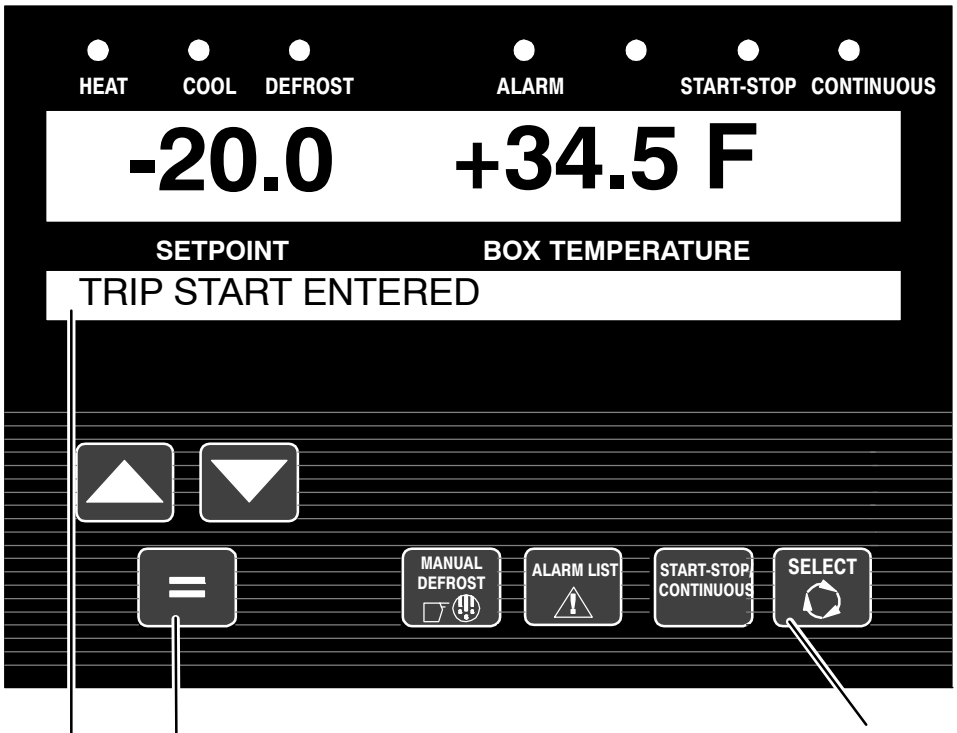
TIP

The Manual Defrost Key can be used at any time to start a Defrost Cycle as long as the preceding conditions are met.

NOTE

Refer to Section 4.6 for more detailed information on DEFROST.

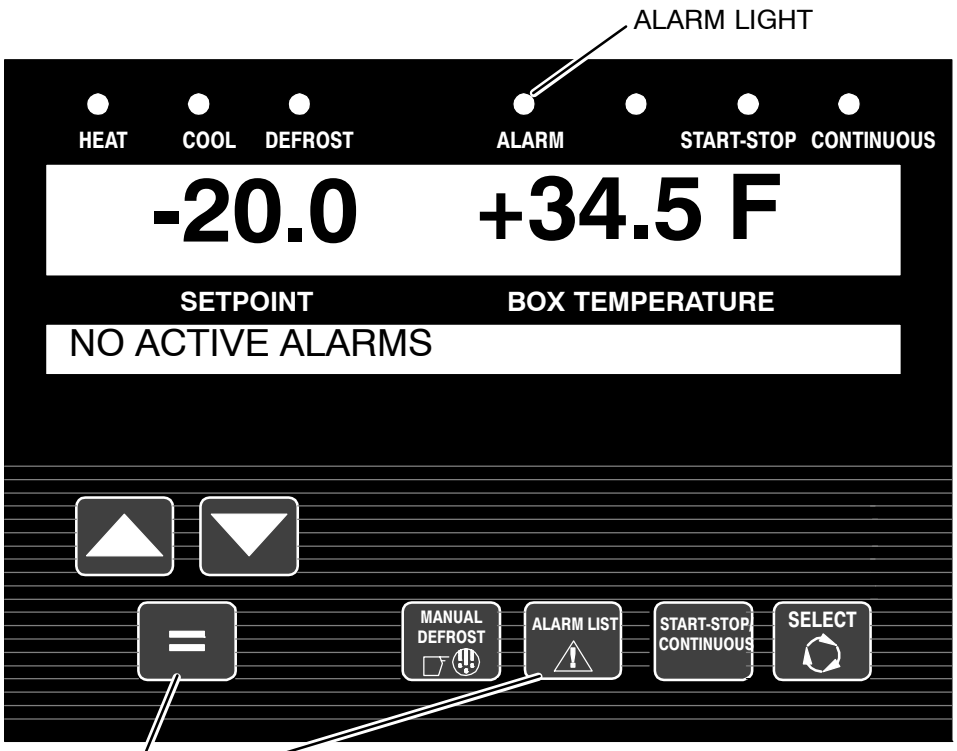
3.10 TRIP START



1. To mark the start of a trip in the DataLink data recorder, press the SELECT key until the MessageCenter displays “PRESS = TO MARK TRIP START”.
2. Press the = key.
3. If trip start is acknowledged by the DataLink data recorder, “TRIP START ENTERED” will be displayed for five seconds and then the display will revert back to the normal display. Otherwise “CANNOT ENTER TRIP START” will flash and then the display will revert back to the normal display.

Trip Start places the present time and date as a stamp in the DataLink data recorder memory to allow easy review of the data from the last trip, and to allow downloading data from a specific trip. A trip begins at a Trip Start and ends at the next Trip Start.

3.11 VIEW ACTIVE ALARMS



1. Press the ALARM LIST key. If there are no active alarms, “NO ACTIVE ALARMS” will display for 5 seconds.
2. If there are active alarms, the alarm number will be displayed with the letter “A” in front and the alarm message following. The last alarm that occurred will be the first alarm displayed and so on.
3. Press the ALARM LIST or UP ARROW key to scroll through the list of alarms.
4. When you reach the end of the alarm list, “LIST END, = TO CLEAR ALARMS” is displayed for five seconds.
5. To clear the alarm list, press the = key while “LIST END, = TO CLEAR ALARMS” is being displayed. “ACTIVE ALARMS LIST CLEAR” is displayed. This will move all Alarms to the Inactive Alarm list.

Alarms are stored in the Alarm List in the microprocessor. Stored alarms may be viewed in the Message-Center.

For a complete list of alarms, their meanings, and troubleshooting refer to Section 7.

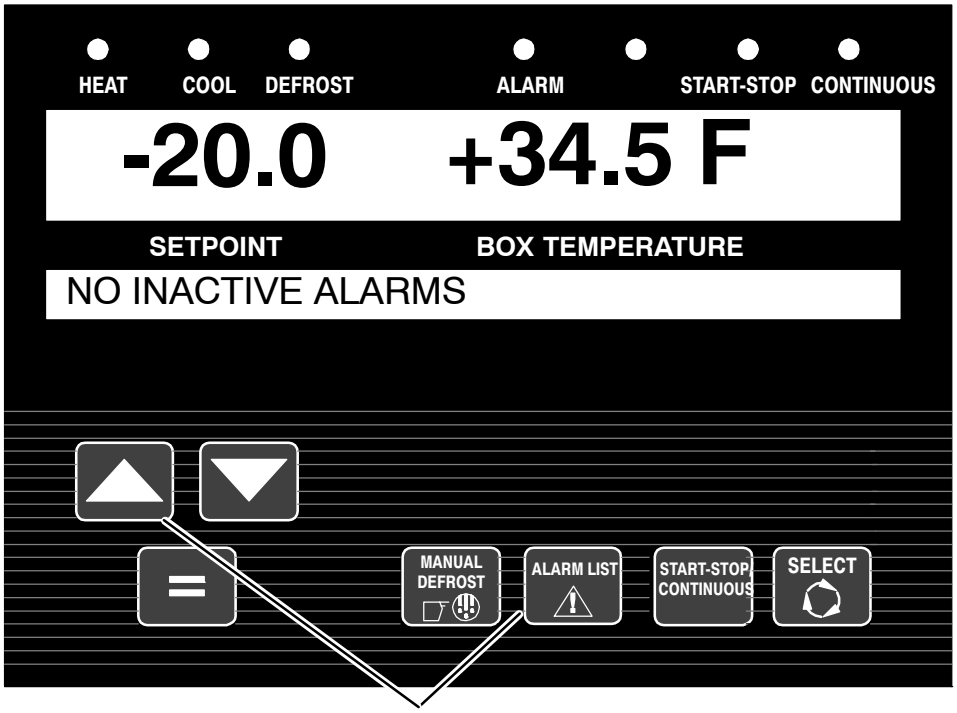
TIP

Another way to clear active alarms is to turn the microprocessor OFF and then back on using the Main Power switch

TIP

“CHK WIRES FROM MICRO TO KEYPAD” indicates there is a wiring problem between the microprocessor and the display module.

3.12 VIEW INACTIVE ALARMS



1. Press and hold both the ALARM LIST key and the UP ARROW key for six seconds. If there are no inactive alarms, the display will read “NO INACTIVE ALARMS” for five seconds.
2. If there are inactive alarms, the display will be ‘I’ in front of the alarm number and message.
3. Press the ALARM LIST or UP or DOWN key to scroll through the list of alarms.
4. When you reach the end of the alarm list, “LIST END, = TO CLEAR ALARMS” is displayed for 5 seconds.
5. To clear the active and inactive alarm list, press the = key while “LIST END, = TO CLEAR ALARMS” is being displayed. “ALL ALARMS CLEAR” is displayed.

The microprocessor can hold up to 16 alarms in the combined Active and Inactive Alarm lists. The lists can be read via the MessageCenter or using the ReeferManager PC Program. There are two sections in the Alarm list, an Active Alarm Section and Inactive Alarm Section. Alarms in these sections are in the order in which the alarms activate and inactivate, respectively. On startup, all alarms are marked as inactive in the entire list. If an inactive alarm becomes active, the alarm is moved from the Inactive Alarm list to the Active Alarm list.

As additional alarms occur, they will be placed first in the Active Alarm list. Each alarm can only be present in either the Active or Inactive Alarm List at any given time. As conditions change, alarms may be moved from the Active Alarm list to the Inactive alarm list and back.

Alarms are also recorded in the DataLink data recorder. They are recorded at the time they occur (become active), and the time they become inactive.

For a complete list of Alarms and troubleshooting information Refer to Section 7.

TIP

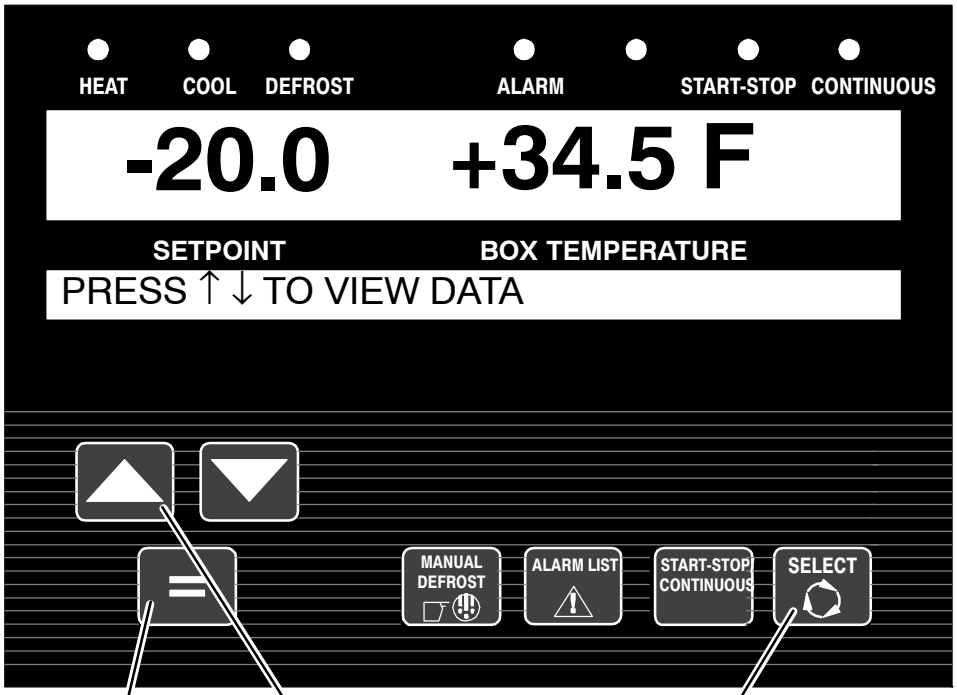
When alarms are cleared from the Inactive Alarm List, both active and inactive alarm lists are cleared.

If there is a safety shutdown “UNIT SHUTDOWN - SEE ALARM LIST” will be displayed. Pressing the Alarm List key will bring any Active Alarms into the MessageCenter. Refer to Section 7 for a complete list of Alarms and their descriptions.

NOTE

The Inactive Alarm List is also called the Technician’s List. Only qualified refrigeration technicians should access the inactive list. It is not intended for the use of drivers or operators.

3.13 UNIT DATA



1. Press the SELECT key until the MessageCenter displays "PRESS ↑↓ TO VIEW DATA."

2. Press the green UP ARROW key. The MessageCenter will display "PRESS ↑↓ TO VIEW DATA, THEN = TO LOCK" . Continue to press the green UP ARROW key to move down the Data List, or press the DOWN ARROW key to move up the Data List. (Refer to Table 3-1.)

3. The selected Data Item will remain in the MessageCenter for ten seconds, then the default message ("STATUS OK" or other customer specified message) will display.

4. To lock an item in the MessageCenter for continuous viewing, press the = key. The Data item will flash continuously to indicate it is locked.

5. Pressing the UP or DOWN ARROW key will unlock that item and move to the next data item. Pressing the = key will unlock the item and, after ten seconds, the default message will be displayed.

Table 3-1 Unit Data

*** Displays information or setting entered in the microprocessor Configurations**		
+ May or may not be displayed depending on Parameter/Configuration settings		
Data readings are presented starting with "SUCTION PRESSURE" and progressing down the list using the green UP ARROW key.		
	DATA	**DEFINITION**
	SUCTION PRESSURE	Compressor suction pressure
	DISCHARGE PRESSURE	Compressor discharge pressure
	EVAPORATOR PRESSURE	Leaving evaporator pressure
	ENGINE COOLANT TEMP	Engine coolant temperature
	RETURN AIR TEMP	Return (air entering evaporator) temperature

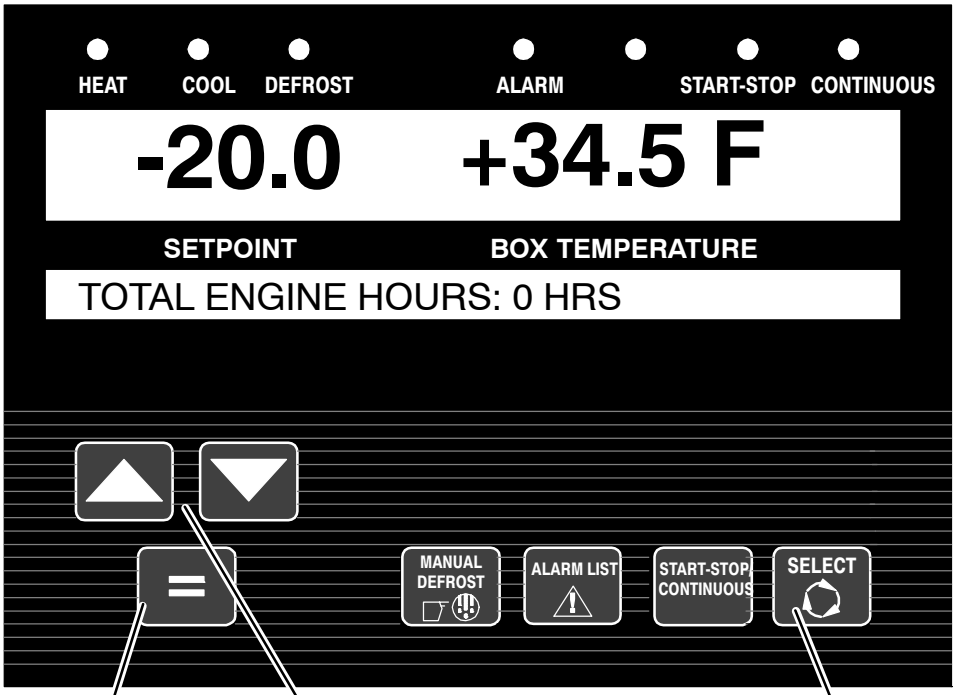
Table 3-1. Unit Data - Continued

*** Displays information or setting entered in the microprocessor Configurations**		
+ May or may not be displayed depending on Parameter/Configuration settings		
	SUPPLY AIR TEMP	Supply (air leaving evaporator) temperature
	DELTA-T	Supply air temperature minus return air temperature
	AMBIENT AIR TEMP	Ambient (air entering condenser) air temperature
	DEFROST TERM TEMP 1	Defrost termination temperature
	SUCTION LINE TEMP	Suction line temperature at the compressor
	EVAP OUTLET TEMP	Suction line temperature leaving the evaporator outlet
	COMP DISCHARGE TEMP	Compressor discharge temperature
	BATTERY	Battery voltage
	CURRENT DRAW (DC)	Battery charging or discharging amps
	ENGINE RPM	Engine speed
	UNIT AC CURRENT #1	High voltage current draw on circuit #1.
	UNIT AC CURRENT #2	High voltage current draw on circuit #2.
+	FUEL LEVEL	This is only displayed when the sensor is configured ON. % of fuel in tank.
	SUCTION MOD VALVE	% open of CSMV
	EXPANSION VALVE	% open of EVXV
	START MODE	AUTO if the engine will start automatically MANUAL if the engine must be started manually
+	INSTALLED OPTIONS	This is only displayed when one or more options is configured ON. Lists installed options. Press “=” to access the list.
	SOFTWARE REVISION	Revision of the software that is operating the microprocessor
	DISPLAY SOFTWARE REV	Revision of the software that is operating the display
	CONTROL SERIAL #	Serial Number of the microprocessor
*	TRAILER ID #	ID (as configured by the user)
*	UNIT SERIAL #	Unit serial number
*	UNIT MODEL #	Unit model number
+	HOURS TO ENGINE MAINTENANCE	This is only displayed when the meter is configured ON. Number of engine hours until the next programmed engine maintenance
+	HOURS TO S/B MOTOR MAINTENANCE	This is only displayed when the meter is configured ON. Number of hours until the next programmed electric standby motor maintenance.
+	HOURS TO UNIT MAINTENANCE	This is only displayed when the meter is configured ON. Number of switch-on hours until the next programmed general unit maintenance.
+	TIME LEFT TO PM (1-5)	This is only displayed when one or more of the meters is configured ON. Number of hours until the next programmed maintenance. (May display user programmed identification.)

Table 3-1. Unit Data - Continued

*** Displays information or setting entered in the microprocessor Configurations**		
+ May or may not be displayed depending on Parameter/Configuration settings		
* +	PRODUCTSHIELD SETUP:	Press "=" to access the list.
	• PRODUCTSHIELD ECONO:	Indicates if ProductShield Econo is **OFF** OR **Go To Start-Stop** OR **Go To Continuous Run**
	•• ECONO MIN TEMP - XX°	Displays minimum temperature setting for activation of ProductShield Econo. (Will only be displayed if Econo is **NOT OFF**)
	•• ECONO MAX TEMP - XX°	Displays maximum temperature setting for activation of ProductShield Econo. (Will only be displayed if Econo is **NOT OFF**)
	•• ECONO DELTA-T - XX°	Displays Delta-T setting for activation of ProductShield Econo. (Will only be displayed if Econo is **NOT OFF**)
	• PRODUCTSHIELD HIGH AIR:	Indicates if ProductShield High Air is **OFF** OR **ON**
	•• HIGH AIR MIN TEMP - XX°	Displays minimum temperature setting for activation of ProductShield High Air. (Will only be displayed if Econo is **NOT OFF**)
	•• HIGH AIR MAX TEMP - XX°	Displays maximum temperature setting for activation of ProductShield High Air. (Will only be displayed if Econo is **NOT OFF**)
	•• HIGH AIR DELTA-T - XX°	Displays Delta-T setting for activation of ProductShield High Air. (Will only be displayed if Econo is **NOT OFF**)
	• PRODUCTSHIELD: WINTER - XX°	Indicates ProductShield Winter is OFF or the ambient temperature below which ProductShield Winter will be active.
* +	RANGE 1 LOCK	This is only displayed when Range Lock 1 is configured ON. Displays Range Lock 1 setting: OFF = Temperature Range 1 Lock is turned off. CONTINUOUS = When the set point is set between Range 1 Minimum & Maximum Temperatures, the unit is set to operate only in Continuous. START-STOP - When the set point is set between Range 1 Minimum & Maximum Temperatures, the unit is set to operate only in Start-Stop.
* +	RANGE 1 MINIMUM TEMP	Displays minimum temperature setting for Range 1. (Will only be displayed if Range Lock 1 is **ON**)
* +	RANGE 1 MAXIMUM TEMP	Displays maximum temperature setting for Range 1. (Will only be displayed if Range Lock 1 is **ON**)
* +	RANGE 2 LOCK	This is only displayed when Range Lock 1 is configured ON. Displays Range Lock 1 setting: OFF = Temperature Range 2 Lock is turned off. CONTINUOUS = When the set point is set between Range 2 Minimum & Maximum Temperatures, the unit is set to operate only in Continuous Run. START-STOP = When the set point is set between Range 2 Minimum & Maximum Temperatures, the unit is set to operate only in Start-Stop.
* +	RANGE 2 MIN. TEMP	Displays minimum temperature setting for Range 2. (Will only be displayed if Range Lock 2 is **ON**)
* +	RANGE 2 MAX. TEMP	Displays maximum temperature setting for Range 2. (Will only be displayed if Range Lock 2 is **ON**)
* +	TEMPERATURE (REMOTE) SENSOR (1, 2 or 3)	Will only display when one or more of the optional sensors are configured ON. Displays temperate reading of remote Temperature Sensor 1 (2, or 3).
*	DATALOGGER (DataLink data recorder)	Displays the current Date and Time that the DataLink data recorder is using. This may be different than local time, depending on the Time Zone and Daylight Savings.

3.14 VIEW HOUR METERS



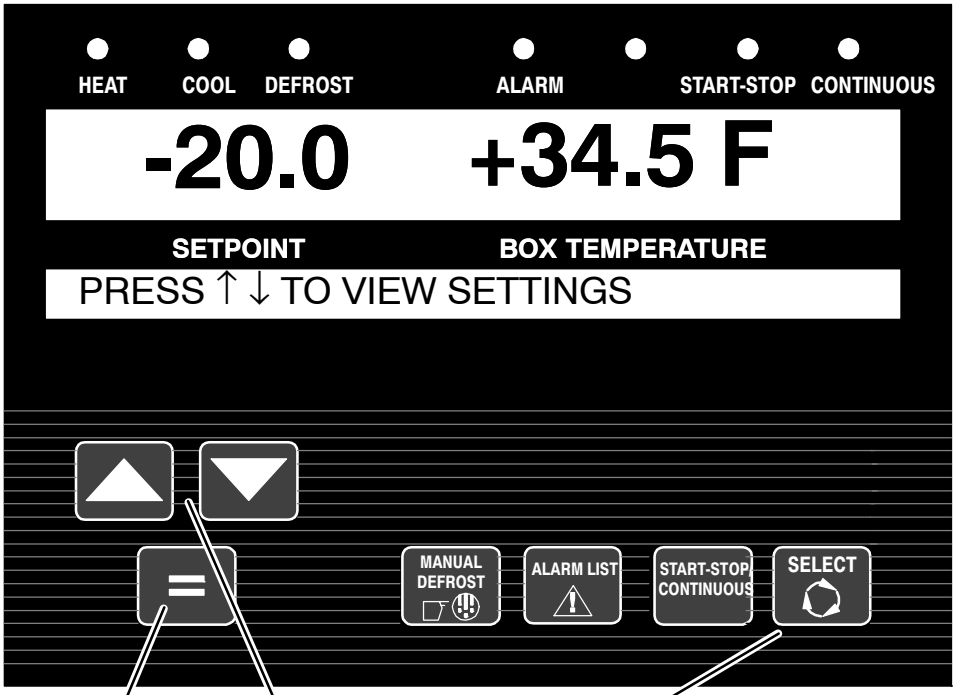
1. Press the SELECT key until the MessageCenter displays “PRESS ↑↓ TO VIEW HOURMETERS”.
2. Press the green UP ARROW key. The MessageCenter will display “PRESS ↑↓ TO SCROLL, THEN = TO LOCK” . Continue to press the green UP ARROW key to move down the hour meter list, or press the DOWN ARROW key to move up the list.
3. Displayed hour meters will depend on microprocessor configurations (refer to Table 5–2). Typical displayed meters are: “TOTAL ENGINE HOURS”, “STANDBY RUN HOURS” and “TOTAL SWITCH ON HOURS”.
4. Pressing the = key will access all other meters and display “OTHER METERS AND COUNTERS”.
5. The selected hour meter will remain in the MessageCenter for 10 seconds, then the default message (“STATUS OK” or other customer specified message) will display.
6. To lock an hour meter in the MessageCenter for continuous viewing, press the = key. The Data item will flash continuously to indicate it is locked.
7. Pressing any key on the keypad will unlock the item. Pressing the UP or DOWN ARROW key will move to the next hour meter.

Hour meters available when “OTHER METERS AND COUNTERS” is chosen are:

•Meters listed in Step 3 above and, up to 5 User Configurable meters including:

- Switch On Standby Hours
- Engine Protect Hours.
- Switch On Protect Hours.
- Engine Sleep Hours.
- Switch On Sleep Hours.
- Compressor Run Hours
- High Speed Hours.
- Start cycles.

3.15 FUNCTIONAL PARAMETERS



1. Press the SELECT key until the MessageCenter displays "PRESS ↑↓ TO VIEW SETTINGS".
2. By pressing the UP ARROW key, you will move through the Functional Parameter list beginning at the top or by pressing the DOWN ARROW key, you will move through the list beginning at the bottom.
3. To change one of the Parameters, bring the Parameter you wish to change into the MessageCenter, and press = key. "↑ ↓ TO SCROLL, THEN = TO SAVE" will display in the MessageCenter. Pressing either UP or DOWN ARROW key will display the Parameter selections available for that Function. The MessageCenter will flash, indicating that a change to the displayed parameter selection has not been entered into memory.
4. Continue pressing UP or DOWN ARROW key until the desired Parameter selection is displayed, then press the = key. The MessageCenter will stop flashing. The new Parameter selection is now in memory. If the = key is not pressed within 10 seconds, the MessageCenter will display "FUNCTION NOT CHANGED". This will display for 5 seconds, then return to the last Functional Parameter displayed. If no further keys are pressed, the default display will return in another 10 seconds.

NOTE

The microprocessor may be configured with all of the Parameters locked or some individual Parameters locked. Any Parameter that is displayed with a padlock symbol cannot be changed from the keypad.

Table 3-2 Functional Parameters

FUNCTION	PARAMETER SELECTIONS	DESCRIPTION
NOTES: Selections in **BOLD** are the default settings. Also, Functional Parameter marked with an asterisk (*) may not display in the list for this unit, depending on how the microprocessor has been configured.		
SILENT MODE	ON **OFF**	OFF - Normal engine speed operation. On - Forced low engine speed operation. Used to disable high speed.
DEFROST INTERVAL TIMER SET FOR	1.5HRS 3HRS **6HRS** 12HRS	The defrost timer will automatically put the unit into the defrost cycle at the interval selected if DTT is below 40°F (4.4°C). Shorter times are generally used for warm, humid products like produce. Longer times can be used for dry and frozen products. **NOTE**: the the timer increments time toward the next defrost only when the DTT is below 40°F and the unit is running.
Set Start-Stop Parameters Time and Temperature values that control Start-Stop Operation are set in this section. The microprocessor may be configured so that: 1. the same settings apply to any set point = “Together”, or 2. the settings are different, depending on whether the set point is in the perishable range or in the frozen range = “Separate”. •If “together” is configured, there will be five settings with only the fifth applicable to just frozen range. •If “Separate” is configured there will be nine settings four labeled perishable and five labeled frozen.		
• MIN RUN TIME:	**4MINS** TO 60MINS (in 1 minute increments)	This determines the minimum length of time the unit will run every time the unit starts in Start-Stop Operation.
• MIN OFF TIME:	10MINS TO 90MINS **20MINS** (in 1 minute increments)	This determines the minimum length of time the unit will remain off whenever the unit cycles off in Auto Start-Stop Operation.
• RESTART TEMPERATURE	0.5°F (2°C) TO 18°F (10°C) **5.5°F (3°C)** (in 0.5°F or C increments)	Following the Minimum Off Time, should the compartment temperature drift this far above or below set point in the Perishable Range or above set point in the Frozen Range, the unit will restart.
• OVERRIDE TEMP:	3.6°F (2°C) TO 18°F (10°C) **11°F (6°C)** (in 0.5°F or C increments)	This selects the override temperature for the Minimum Off Time portion of the Auto Start-Stop Off Cycle. During the Minimum Off Time, should the compartment temperature drift this far above or below set point in the Perishable Range, or above set point in the Frozen Range, the microprocessor will override the Minimum Off Time, and restart.
• MAX OFF TIME:	**OFF** 10MINS TO 255MINS (in 1 minute increments)	OFF = There is no maximum off time. When a minute value is selected, this is the longest amount of time the unit will remain off during a (Perishable or Frozen or both) Auto Start-Stop Off Cycle. When this time expires, the unit will restart and run for the Minimum Run Time, regardless of any temperature change inside the compartment.
• FROZEN SHUTDOWN OFFSET	**0°C (0°F)** TO 2°C (3.6°F) (in 0.5°F or C increments)	This only applies to Frozen set points in Start-Stop operation. The system generally will allow an off cycle when the RAT is 0.5°F (0.3°C) above set point. This offset is the number of degrees below the 0.5°F (0.3°C) value that the unit will run before cycling off. This will allow for a lower average compartment temperature when considering temperature rises during off cycles.

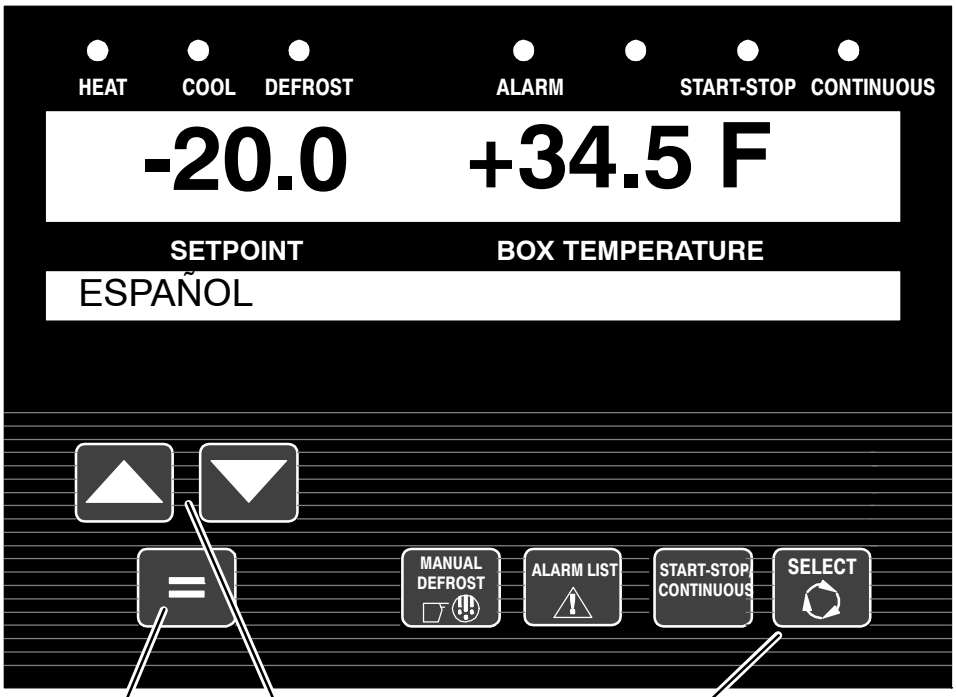
Table 3-2 Functional Parameters - Continued

FUNCTION	PARAMETER SELECTIONS	DESCRIPTION
PERISHABLE SENSITIVE PRODUCT	ON **OFF**	OFF = Supply air temperature will be limited to the colder temperature of 32°F (0°C) or set point less the Supply Air Limit Configuration value.
		ON = Supply air temperature will be limited to set point less the Supply Air Limit Configuration value.
		Refer to Section 4.7.1 for complete information on Perishable Sensitive Product and Supply Air Configuration interaction.
TEMP CONTROL	**RETURN AIR** SUPPLY AIR	The evaporator has both a Return Air Sensor and a Supply Air Sensor.
		RETURN AIR = only the return air sensor reading will be used for calculating control actions. “Return Air” is generally selected for most products.
		SUPPLY AIR = the microprocessor will switch to the supply air sensor when operating with a perishable set point (10.4°F [-12°C] or above). “Supply Air” will control within a narrower temperature band.
DISPLAY TEMPS IN ...	**FAHRENHEIT** CELCIUS	The compartment temperature will display in either English (°F) using a decimal point to display tenths of a degree OR or Metric (°C) using a comma to display tenths of a degree. NOTE: Temperature setting values displayed in the MessageCenter will continue to use a decimal for both °F and °C.
DISPLAY PRESSURES IN ...	**PSIG** BAR	Pressures will display in either English (psig) or Metric (bar).
ECO MODE	**NO** YES	NO = When in Continuous Operation, control for maximum temperature protection.
		YES = When in Continuous Operation, control for maximum fuel economy.
RESET PM HOUR-METERS		This Functional Parameter allows resetting of the PM maintenance alarm when an hour meter has timed out, or when over 95% of the time out value has expired. If a maintenance interval has not been configured for the alarm, this parameter will not display. Selecting RESET and pressing the = key will de-activate the alarm, and reset the hour meter for the next maintenance interval. The amount of time added back into the meter before the next alarm trigger is determined by the maintenance interval entered in the meter Configuration. If there are active maintenance hour meters and none have expired and turned the alarm on, or none are within 95% of the time out value, the MessageCenter will display “NO METERS TO RESET.” **NOTE:** If a reset is required for a meter that has not timed out, the meter must be configured with a “0” reset value (to turn it off) and then reconfigured with the desired reset interval. Refer to Section 5 for Configuration instructions.
• STANDBY RUN HOURS	RESET	
• TOTAL ENGINE HOURS	RESET	
• TOTAL SWITCH ON HOURS	RESET	
• PM 1 Thru 5	RESET	
OUT OF RANGE ALARM	Metric / English OFF / OFF 2°C / 4°F 3°C / 5°F **4°C / 7°F**	The value entered here is the number of degrees away from set point the compartment temperature may drift before the compartment is considered “Out Of Range” and the configured alarm or alarm and shutdown action will be activated. Refer to Alarm A53 - “BOX TEMPERATURE OUT OF RANGE” (Section 7) for more information.

Table 3-2 Functional Parameters - Continued

FUNCTION	PARAMETER SELECTIONS	DESCRIPTION
Low Speed Startup Minutes Allows user to set the number of minutes the unit will run in low speed every time the engine starts. Press "=" to access menu.		
•CONTINUOUS	**OFF** 1 TO 255MINS **1 MINUTE**	Allows user to set the number of minutes the unit will run in low speed every time the engine starts in Continuous operation.
•START-STOP	OFF 1 TO 255MINS **10 MINUTES**	Allows user to set the number of minutes the unit will run in low speed every time the engine starts in Start-Stop Operation.
SLEEP MODE SETTINGS	For complete instructions on entering and setting parameters for Sleep Mode refer to Section 3.8. Press "=" to access menu.	
* NO S/B POWER	SWITCH TO DIESEL **SHUT UNIT DOWN**	***If the NO AC POWER Configuration is set to "Alarm & Shutdown" this parameter will not display
		SWITCH TO DIESEL = If the NO AC POWER Configuration is set to the "Switch To Engine" (on power loss), setting this parameter to "SWITCH TO DIESEL" will confirm the Configuration and the switch will be allowed.
		SHUT UNIT DOWN = If the NO AC POWER Configuration is set to the "Switch To Engine", setting this parameter to SHUT UNIT DOWN will override the Configuration setting and shut the unit down when power is lost. The purpose of this setting is to temporarily override the Configuration setting in situations where switching to engine power is not desired.
OVERRIDE REMOTE SWITCH 1 SHUTDOWN (REMS1)* **AND** OVERRIDE REMOTE SWITCH 2 SHUTDOWN (REMS2)* **AND** OVERRIDE DOOR SWITCH SHUTDOWN (DS)*	**NO** YES	***If the Switch is configured "Switch Not Installed", this parameter will not display
		NO = the microprocessor will respond to the switch as configured
		YES = the configured action on activation of the switch will be overridden and the action will be alarm only. The purpose of this setting is to temporarily override the Configuration setting in situations where shutdown or speed change is not desired.
LANGUAGE: IDIOMAS: LANGUE: LINGUAGEM:	ENGLISH	**ENGLISH**- All information displayed in the MessageCenter will be displayed in English.
	ESPAÑOL	FRANÇAIS- All information displayed in the MessageCenter will be displayed in French.
	FRANÇAIS	ESPAÑOL- All information displayed in the MessageCenter will be displayed in Spanish.
	PORTUGUÊS	PORTUGUÊS - All information displayed in the MessageCenter will be displayed in Portuguese.
	NOTE 1: This parameter can be quickly accessed by pressing and holding the Select Key for 6 seconds. **NOTE 2:** If the padlock is visible when accessing language from the Functional Parameter List, the language cannot be changed. However, when accessing the language by pressing and holding the Select Key for 6 seconds the language can be changed even if the padlock is displayed.	

3.16 LANGUAGE SELECTION



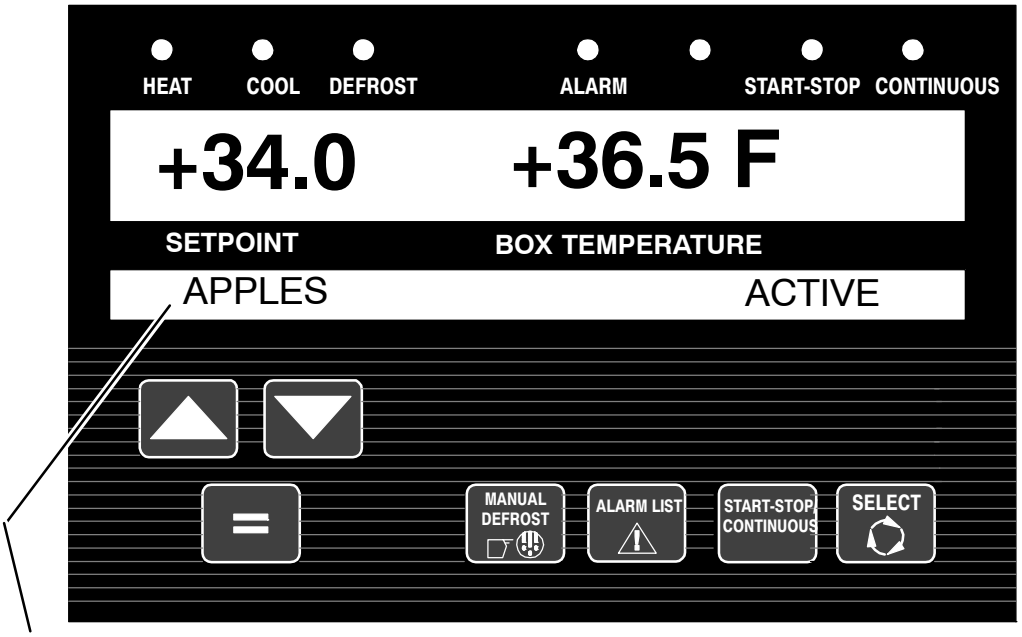
1. Press and hold the SELECT key for 6 seconds until MessageCenter displays the current language (ENGLISH, ESPAÑOL, FRANÇAIS or PORTUGUÊS).

2. Press the UP or DOWN ARROW key until the MessageCenter indicates the desired language. Press the = key. The new language will now be active.
   If the = key is not pressed within 10 seconds, the MessageCenter will change to "FUNCTION NOT CHANGED". This will flash for 5 seconds, then return to the current language. If no further keys are pressed, the default display will return in another 10 seconds.

TIP

If the language is set to one that the user does not understand, press and hold the "SELECT" key for 6 seconds to bring up the Language Parameter so that it can be changed.

3.17 INTELLISET



DURING START UP

Observe the MessageCenter during the power up process. If an IntelliSet is running, the name of the IntelliSet will be displayed for approximately 10 seconds before the unit starts.

DURING OPERATION

Press the SELECT key to view current IntelliSet. You will be prompted to press either the "=" key or the UP or DOWN ARROW Key to scroll through list of IntelliSets. The current IntelliSet will have either the word ACTIVE or MODIFIED after it. MODIFIED indicates that one or more of the IntelliSet settings (other than set point) have been changed. To change MODIFIED to ACTIVE, press = key while the IntelliSet is displayed in the MessageCenter.

The Advance Microprocessor offers up to 31 parameters that may be set depending on the product being carried. IntelliSet allows the owner to pre-program specific product settings into the microprocessor and give the settings a name. The operator may then call up these settings by simply selecting the IntelliSet name.

For example: A load of apples may require continuous operation at 35°F (1.7°C) with a defrost every 3 hours while a load of cheese may require the same operation with set points ranging from 35°F to 42°F (1.7°C to 5.6°C) and a load of ice cream requires Start-Stop operation at -22°F (-30°C) with defrost at 12 hour intervals. The settings required for each product may be entered into the microprocessor and then locked so they cannot be changed. In the case of the cheese, the range of set points may be locked, leaving the operator the ability to change the set point within the locked range.

When a load of apples is going to be picked up, the operator simply selects "APPLES" from the IntelliSet menu; for cheese, "CHEESE" is selected ; for ice cream, "ICE CREAM" is selected. With each selection, the microprocessor automatically re-programs the settings to provide the best temperature control, fuel economy, and performance for that particular product.

NOTE

The above settings are **examples** of possible settings. Factory IntelliSets are available from your authorized Carrier Transicold Truck/Trailer dealer.

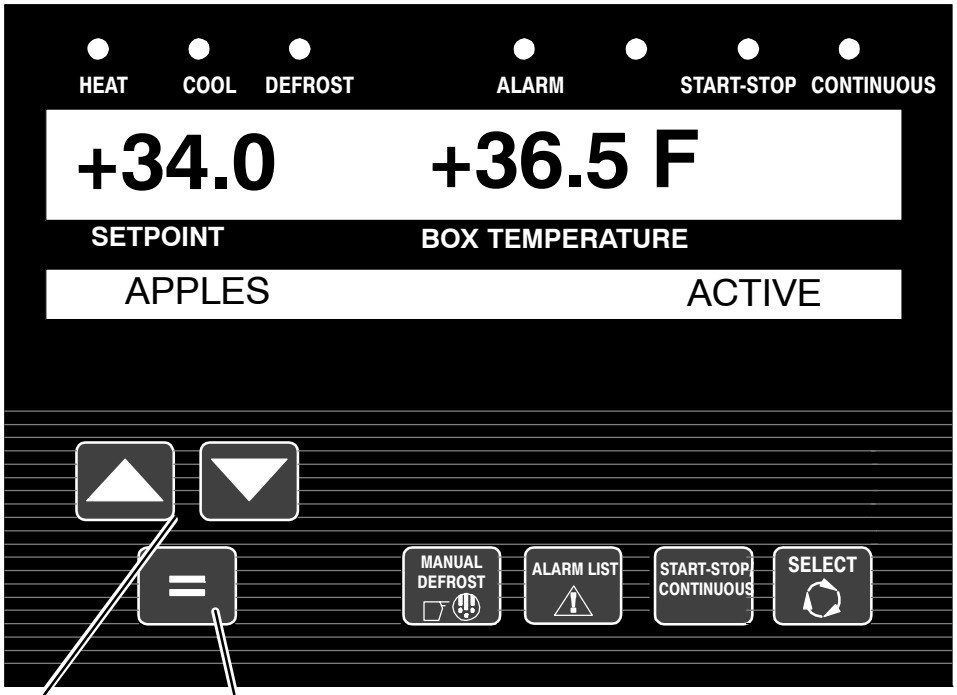
NOTE

IntelliSet #32 is Range Protect, it is designed to prevent freezing or overheating of non-sensitive cargo by locking the unit is Start-Stop Operation when the compartment temperature is in the pre-set range (default range is 32 to 72°F, 0 to 32°C). Range Protect offers increased power savings over normal Start-Stop Operation.

The ONLY way to exit from Range Protect is to select a different IntelliSet.

3.17.1 Changing IntelliSets - With the = Key Enabled.

NOTE: If pressing the = key does not bring up the IntelliSet message the microprocessor is not configured with this feature. To view IntelliSets, refer to the following section.

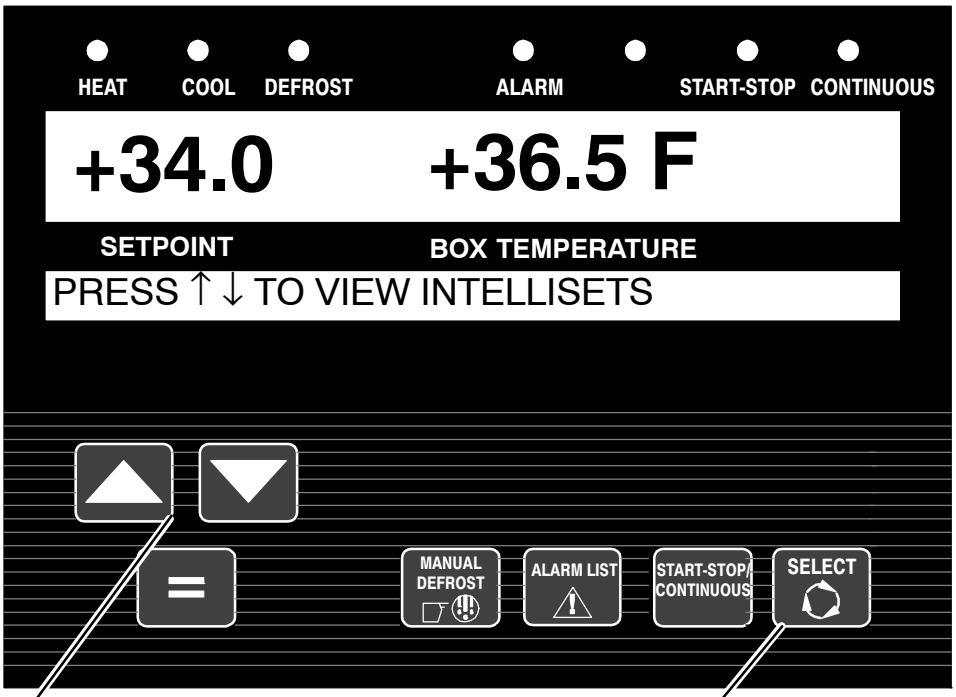


1. PRESS the = Key to display current IntelliSet.

2. Press the UP or DOWN ARROW key, to move through the IntelliSet List. The current IntelliSet will have either ACTIVE or MODIFIED to the right of the name.

3. To use a different IntelliSet, bring the desired IntelliSet into the MessageCenter and press the = Key.

3.17.2 Changing IntelliSets - Without the = Key Enabled.

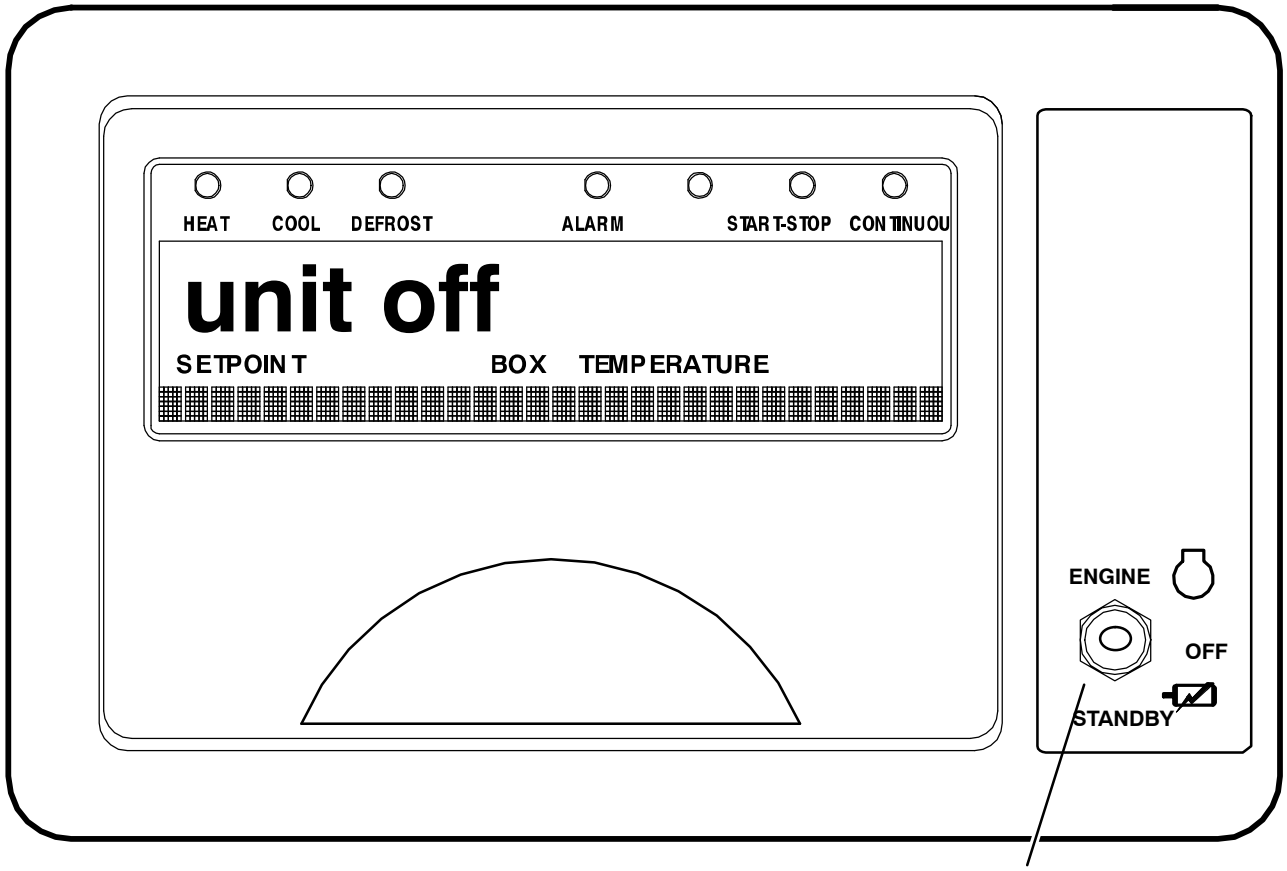


1. Press the SELECT key until MessageCenter displays "PRESS ↑↓ TO VIEW INTELLISETS".
2. When the UP ARROW key is pressed, the IntelliSet List will scroll up, beginning at the bottom. When the DOWN ARROW key is pressed, the IntelliSet List will scroll down, beginning at the top. The current IntelliSet will have either "ACTIVE" or "MODIFIED" to the right of the name.
3. Bring the IntelliSet you wish to use into the MessageCenter and then press the = key. The selected IntelliSet will now become active.

3.18 STOPPING UNIT

⚠ WARNING

Always place the Main Power switch in the OFF position and turn off the high voltage power supply before disconnecting the high voltage power plug from the unit.



To stop the unit, place the Main Power switch in the OFF position.

The diesel engine or compressor will stop and the microprocessor will display “MICRO WILL STOP IN ## SECONDS”. At the end of the countdown time the Microprocessor Main Display, MessageCenter, and all indicator LEDs will then turn off.

NOTE

Due to internal processing within the microprocessor, turning the Main Power switch off then back on will result in a 4 to 50 second delay between the display going off and coming back on again.

NOTE

The microprocessor will close the Electronic Expansion Valve (EVXV) and the CSMV to 0% open before turning off.

3.19 DataLink DATA RECORDER

The Advance microprocessor contains a built-in DataLink data recorder with 512K of memory. The recorded data can be downloaded from the DataLink data recorder using either ReeferManager or a Download PC card.

The DataLink data recorder reads the same input information as the microprocessor (Functional Parameters, Configurations, and Unit Data) at all times. The DataLink data recorder records events as they occur, such as set point changes and defrost initiation and termination, and also records all data values including temperature sensors and pressure transducers in either averaged or snapshot format.

The following intervals are available for sensor recording:

2 Minutes	30 Minutes
5 Minutes	1 Hour
10 Minutes	2 Hours
15 Minutes	4 Hours

3.19.1 Microprocessor Information

The microprocessor information that may be recorded is as follows:

- DataLink data recorder setup (Logging Intervals, Events and Sensors)
- DataLink data recorder time clock date / time
- Set points
- ID Number
- Unit Serial Number
- Unit Model Number
- Trailer ID
- Current System Mode
- Functional Parameters
- Microprocessor Configurations

3.19.2 Data Recording

The DataLink data recorder data comes from four general categories of information:

a. Microprocessor Information as described in Section 3.19.1 above.

b. Sensor Data

This information is recorded at pre-determined intervals as a snapshot of the sensor at the time of the recording, or an averaged reading of the sensor readings since the last recording. The user can determine which sensor(s) will be recorded, at what intervals, and whether snapshot or averaged readings are preferred. (Snapshot readings of sensors are also taken at the time of a shutdown alarm.)

All of the sensors and transducers that may be read under Unit Data (refer to Table 3-1) may be included or excluded form the recordings.

c. Event Occurrences

This information is any additional data that is recorded on a “when it occurs” basis. Events are recorded by the recorder as they occur. An Event is defined as something that happens and may include:

- Set point change
- Defrost cycle start
- Main power on
- Pretrip start
- Pretrip end
- Unit mode (Start-Stop or Continuous Operation)
- Control mode (Heat, Cool, High/Low speed, etc)
- Door and Remote switch activations.
- Hour Meter readings (Hour meters are recorded at midnight or the first time of day the Main Power switch is toggled out of the OFF position.

d. User Area Data

The User or service technician may enter a Comment into the DataLink data recorder using the ReeferManager program.

3.19.3 Data Downloading

The data within the DataLink data recorder can be downloaded using either the ReeferManager program with a download cable connected to the download port or with a Download PC card (refer to Section 5.3). If a PC card is used, the ReeferManager program is then used to extract the data from the PC card, and place it on the computer hard disk.

3.19.4 DataLink Data Recorder Power-Up

The DataLink data recorder records data the entire time the Main Power switch is not in the OFF position. A Configuration exists which allows the user to select either an additional 8 hours of sensor data be recorded after the switch is placed in the OFF position, or to stop recording at the same time the switch is placed in the OFF position. The factory setting is to stop recording at the same time the switch is placed in the OFF position. (Refer to Section 5.2.1.)

3.20 OPTIONS

3.20.1 DataTrak

DataTrak allows remote communication with the Advance microprocessor (cellular, satellite, etc).

One way Communication providers can request data from the Advance microprocessor and transmit it via their equipment to another location. This is typically done via the Internet to any destination in the world.

⚠ WARNING

Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.

Two Way Communication providers can also send commands via their equipment to the Advance microprocessor to start or stop the unit, change settings and the way the microprocessor is operating the unit.

DataTrak is an optional feature. The DataTrak option is installed by inserting a DataTrak PC Card into the PC Card slot of the microprocessor and following the on-screen instructions on the keypad.

The DataTrak Option installation can be confirmed by scrolling through the Unit Data (refer to Section 3.13). DataTrak will be listed under the Installed Options heading if it is installed.

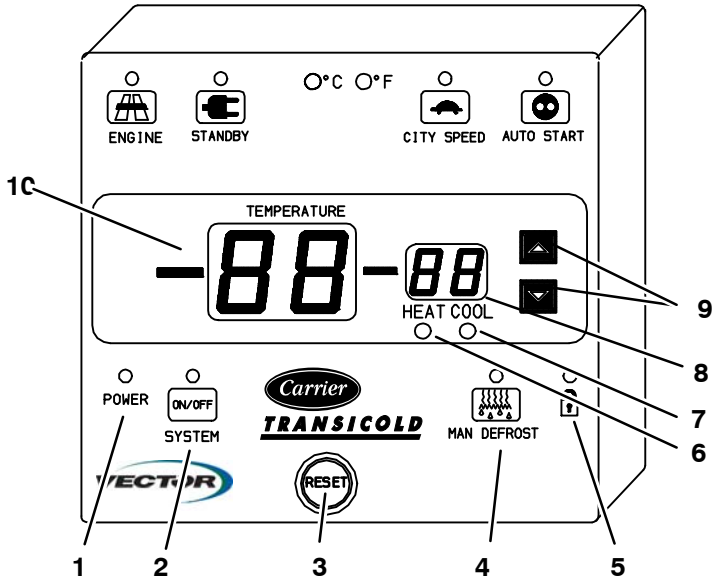
Once DataTrak is installed, the Advance Microprocessor must be properly configured for the provider that will be connecting to it (refer to section 5.2.1). The Satellite Com configuration can be set for “Qualcomm” or “Other”.

If the provider is Qualcomm T2 (Trailer Tracs 2) or any other provider then the “Other” setting is used. If the provider is Qualcomm Trailer Tracs then the “Qualcomm” setting is used.

Carrier Transicold has worked with approved communication providers with recommended installation locations, and wiring connections to Carrier units. Instructions for installing this equipment is supplied by each individual provider, and not by Carrier Transicold. Communications electrical harnesses and serial port splitters are available from Carrier Transicold Performance Parts Group (PPG).

Communication Providers will connect into the wiring harness at the SATCOM port. Testing the SATCOM port may be done using a serial port to PC cable (22-01690-00) and the ReeferManager program. If ReeferManager can communicate with the microprocessor the unit wiring and microprocessor are performing normally and any communication problem is with the provider’s equipment.

3.20.2 Remote Control Panel



1 Control panel power on LED
2 System ON/OFF key
3 Reset Button
4 Manual defrost key
5 Control panel lock LED
6 HEAT mode LED
7 COOL mode LED
8 Set point display
9 Up and down arrow keys
10 Temperature display

TEMP. DISPLAY	SET POINT DISPLAY	
--		WAITING FOR COMMUNICATION WITH MICROPROCESSOR
	OF	UNIT WAS TURNED OFF VIA REMOTE CONTROL
dF	-20	UNIT IN DEFROST MODE
--	-20	TEMPERATURE SENSOR MALFUNCTION
P1	-20	DISPLAYED WHEN SETTING PRE-SET SETPOINTS

NOTE:
1. TEMPERATURE DISPLAY (°C OR °F) IS DEPENDENT ON MICROPROCESSOR CONFIGURATION
2. ENGINE LIGHT WILL NOT ILLUMINATE IN THIS APPLICATION.

The unit may be fitted with an optional remote control panel. The panel displays compartment set point, compartment temperature and operating modes (heat, cool or defrost). The set point may be set and the unit may be started and stopped using the remote panel.

This compact panels can be mounted to suit the individual operator's preferences - in the cab, on the front bulkhead, or in the compartment (including in the wall itself).

The remote control panel can be used to :
Turn the unit on or off:

- Check compartment temperature
- Check and change set point
- Initiate manual defrost
- Check mode of operation

a.Starting Unit with Remote Control Panel

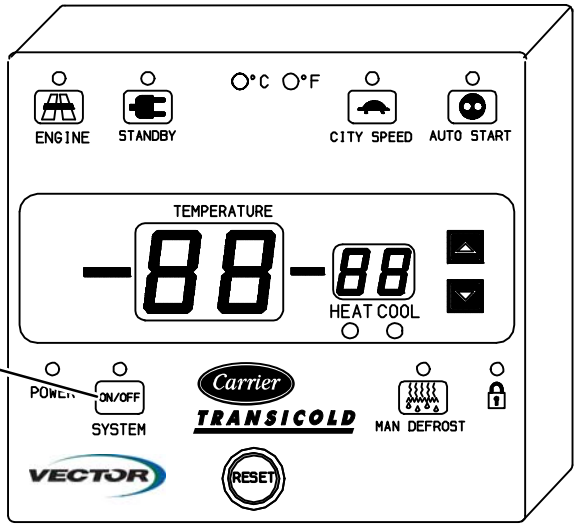
NOTES

1. The unit can be shutdown using either the remote panel or the unit switch panel mounted Main Power switch. The remote panel cannot operate if the unit switch panel mounted Main Power switch is in the OFF position.

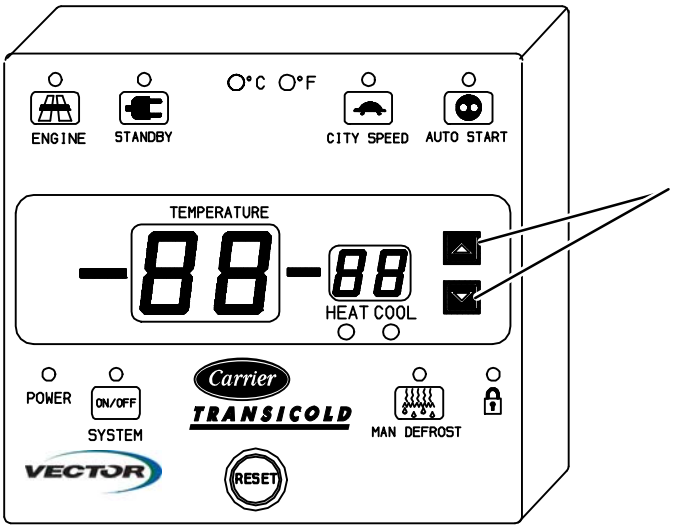
2. In order to prevent a constant drain on the battery, the remote panel will de-energize after two hours. If the panel is equipped with a RESET button, press the button to re-energize the panel. If the panel is not equipped with a RESET button, the panel may be re-energized by placing the unit switch panel mounted Main Power switch in the OFF position and then back in the desired position.

1. Place the unit switch panel mounted Main Power switch in the desired position.

2. Press The SYSTEM ON/OFF Key. The POWER Light will illuminate.

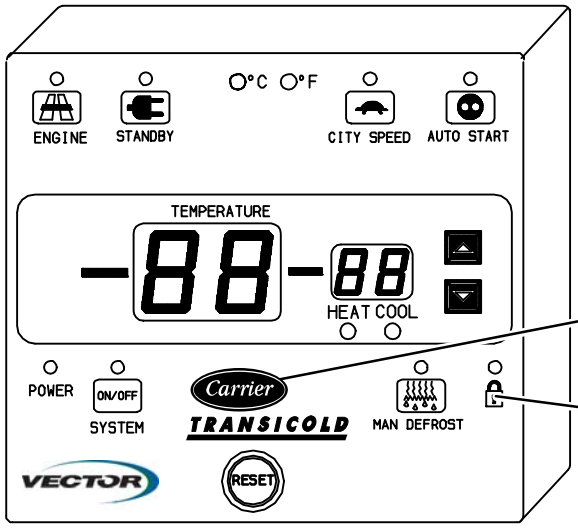


b. Changing Set Point With Remote Control Panel



Press the UP or DOWN ARROW key to increase or decrease set point.

c.Lock / Unlock the Remote Control Panel



LOCKING THE PANEL:
Press and hold the Carrier Logo for approximately one second and then release.
The lock indicator light will illuminate.

UNLOCKING THE PANEL:
Press the Carrier Logo for 10 seconds
The lock indicator light will de-energize.

CARRIER LOGO

LOCK INDICATOR LIGHT

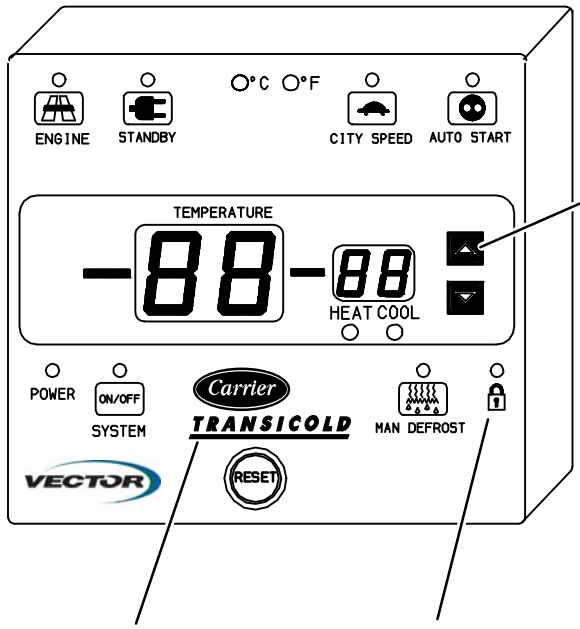
d. Pre-setting Set Point With Remote Control Panel

The control panel allows the user to pre-set 5 different temperatures.

NOTE

Once preset set points have been chosen, only those 5 designated set points can be used.

1. Place the unit switch panel mounted Main Power switch in the desired position.



3. Press UP ARROW for 10 seconds. P1 will be displayed.

4. Set lowest set point required.

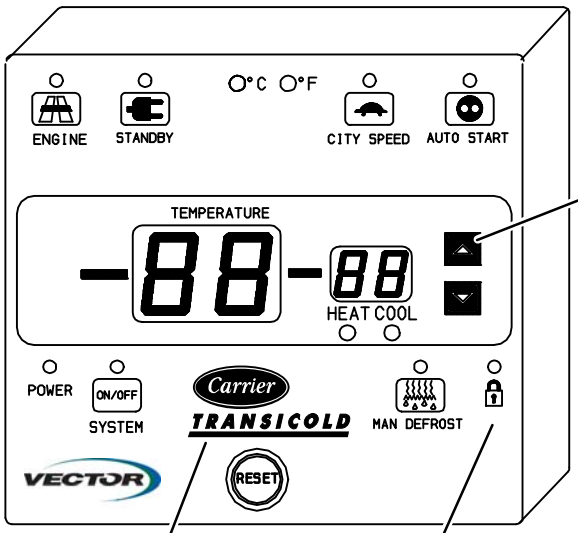
5. Press Carrier logo and P2 will be displayed. Set next highest temperature required.

6. Follow same procedure for the next three temperatures.

2. Press Carrier logo and the lock light will illuminate.

e. Removing Pre-Set Set Points With Remote Control Panel

1. Place the unit switch panel mounted Main Power switch in the desired position.



3. Press UP ARROW for 10 seconds. P1 will be displayed.

4. Set temperature to lowest pre-set set point and OFF will be displayed

2. Press Carrier logo and the lock light will illuminate.

SECTION 4 – ENGINE/STANDBY/TEMPERATURE CONTROL

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SECTION 4

ENGINE/STANDBY/TEMPERATURE CONTROL

NOTES

1. If the unit is in an alarm condition, the microprocessor alarm response may override the operation described herein. If an alarm is displayed in the MessageCenter, refer to the specific alarm description in Section 7 for “Unit Control” descriptions.

2. With the complex control systems in use with the Advance microprocessor there are many user selected and preprogrammed software overrides which may change the operation of the unit. Refer to Sections 4.7 & 4.8 for complete descriptions of these features.

4.1 INTRODUCTION

This section describes operation of the unit when power is supplied from an external source - Standby Operation and when power is supplied by the internal generator - Engine Operation. The section also describes two additional sub-categories of operation; Start-Stop Operation (with standby or engine power) and Continuous Operation (with standby or engine power).

For descriptions of refrigerant system component interaction when cooling, with flow diagram, refer to section 2.14.

4.2 ENGINE/STANDBY OPERATION

Engine or Standby Operation is chosen by positioning of the switch labeled ENGINE/OFF/STANDBY (DOES) OR positioning of the switch labeled STANDBY/ENGINE (DES).

With the switch in the STANDBY position the power supply contactor relay (PSCONR - see wiring schematic, Section 10) is energized. Energizing PSCONR reverses its contacts to allow power from the power plug while the engine is shutdown and power from the generator is locked out.

With the switch in the ENGINE position the generator contactor relay (GENCONR) is energized. Energizing GENCONR reverses its contacts to allow the engine and generator to operate while power from the power plug is locked out.

Once the Main Power switch is toggled from the OFF position, the compressor suction modulating valve (CSMV) and evaporator expansion valve (EVXV) will both open to a predetermined position, to equalize system pressure, and then close (0% open) before the unit starts.

NOTE

The unit will not restart for at least 30 seconds following a shutdown.

4.2.1 Standby Start-Up

On command to perform a Start-Up in Standby Operation the microprocessor will energize the buzzer for five seconds. The refrigeration system or heaters will then operate in the mode(s) required for temperature control.

4.2.2 Engine Start-Up

On command to perform a Start-up in Engine Operation the microprocessor will enter the engine start sequence to start the engine and direct connected generator. Following start, the refrigeration system or heaters will then operate in the mode(s) required for temperature control.

At the beginning of the start sequence the microprocessor will close the run relay (RR) contacts to signal the engine speed control unit (ENSCU) that engine operation is required and to provide power to the optional electric fuel pump (FP - if supplied). During the start sequence the engine speed control unit (ENSCU) will hold the engine in low speed.

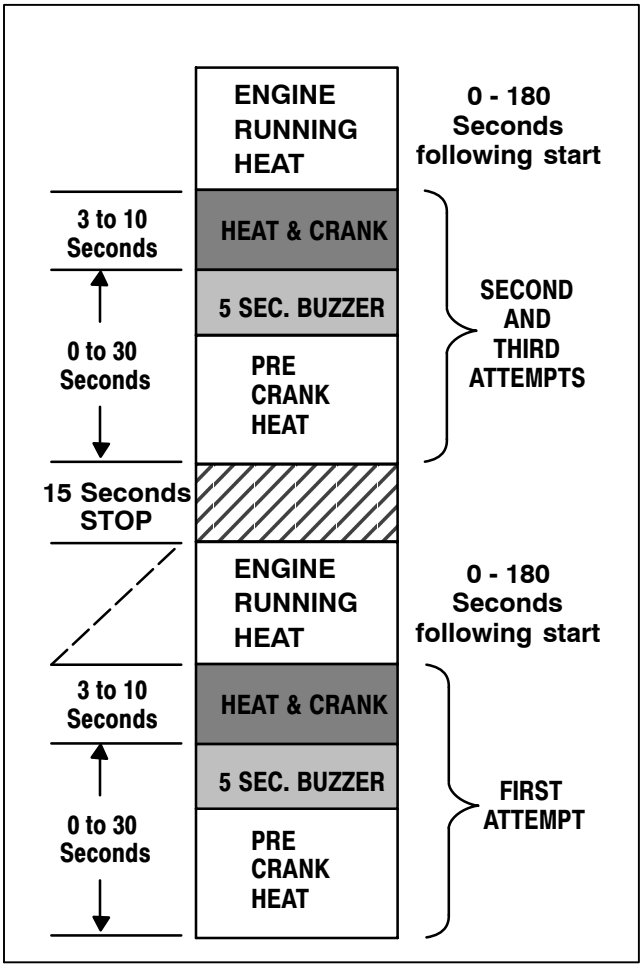


Figure 4–1 Auto Start Sequence

The engine start sequence consists of periods of time with the intake air heater relay (IAHR) or glow heater relay (GPR) and starter solenoid relay (SSR) energized and de-energized for up to three start attempts. See Figure 4−1.

Energizing the heater relay closes its contacts to energize the intake air heater (IAH), the heating time will vary in duration based on engine coolant temperature (refer to Table 4−1).

Table 4−1 Intake Air Heat Time

Engine Coolant Temperature	Heat Time in Seconds	
	Preheat	Post Heat
Less than 33°F (1.0°C)	30	180
33°F to 51°F (1.0°C to 11°C)	20	120
51°F to 78°F (11°C to 26°C)	10	60
Greater than 78°F (26°C)	0	0

If the A129 - “CHECK ENGINE COOLANT SENSOR” alarm is active, the microprocessor assumes a temperature of less than 32°F (0°C) for the heat timing.

During the last five seconds of Preheat **OR** for 5 seconds before a start attempt, if no Preheat is required, the buzzer (B) is energized; then the starter solenoid relay (SSR) will be energized for a maximum of ten seconds while the engine condition is checked each two seconds during the cranking period. The engine is considered to be running, and the start sequence will be stopped, when engine speed is greater than 1000 rpm.

During the second and third attempts, the microprocessor will monitor additional inputs.

• When engine speed reading is less that 1000 rpm, ambient temperature is above 32°F (0°C) and the ENOPS is closed the A130 - “CHECK ENGINE RPM SENSOR” alarm will be activated and the engine will be considered running.

• When engine speed reading is less that 1000 rpm, ambient temperature is below 32°F (0°C), the ENOPS is closed and DC current is more than 2 amps the A130 - “CHECK ENGINE RPM SENSOR” alarm will be activated and the engine will be considered running.

Once the engine is considered running, the microprocessor will keep the intake air heater energized for an additional 0 to 180 seconds of Post Heat, depending on engine coolant temperature (refer to Table 4−1).

During the start sequence the microprocessor monitors engine speed while cranking. If engine speed drops below 50 rpm for three seconds the starter solenoid contactor will be de-energized and the A35 - “CHECK STARTER CIRCUIT” alarm will be activated.

If the unit fails to start after three start attempts, the A31 - “FAILED TO START-AUTO” alarm will be activated.

If the unit is equipped with a fuel heater, the microprocessor will monitor ambient temperature. If ambient is below 77°F (25°C) power will be supplied to the fuel heater relay (FHR). Energizing FHR closes its normally open contacts to supply power through the fuel heater temperature switch (FHTS) to the heater. Refer to Section 2.8 for FHTS settings.

4.2.3 Transition To High Speed

After a successful start, the microprocessor may call for the engine to transition to high speed. Three factors control this transition.

- First, transition may be delayed if a time value is entered in either the START-STOP HIGH SPEED DELAY or CONTINUOUS HIGH SPEED DELAY Configuration. The delay may be set to OFF **or** from 0 to 255 minutes. The factory default setting for Start-Stop Operation is 10 minutes while the factory default setting for Continuous Operation is OFF. If the entered value for the present mode of operation is OFF, high speed operation is not allowed for two minutes following start.
- Second, the engine cannot transition if the SILENT MODE functional parameter is set to YES. The value may be set to YES or NO. The factory default setting is NO. (Refer to Table 3-2).
- Third, transition will be based on the need for temperature control. Generally, the engine will operate in high speed when the unit is in Pulldown or Pull-Up Mode (full capacity required) and in low speed when the unit is in most less than full capacity required operating states.

4.3 TEMPERATURE CONTROL

4.3.1 Temperature Determination

The microprocessor monitors the temperature readings from the supply and return temperature sensors to determine the mode of operation required to maintain compartment temperature in accordance with the set point.

The sensor used for temperature control is dependent on the selection made in the “TEMP CONTROL” functional parameter.

- If the selection is “RETURN AIR” the return air sensor (RAT) will be used, for any set point.
- If the selection is “SUPPLY AIR” the microprocessor will switch to the supply air sensor (SAT) when operating with a perishable set point (refer to Section 4.3.2 for more information on frozen and perishable set points) and the return air sensor will continue to be used for frozen set points.

The modes of operation include Pulldown, Pull-Up, Cooling, Heating and Null.

NOTES

1. The compressor is always started with both unloaders energized (unloaded). After 10 seconds of operation (for UL1) or 1 minute of operation (for UL2) they are allowed to transition to the unloader state required for the present mode of operation.

2. The condenser fan will operate any time the engine or compressor is operating.

3. If suction pressure is below 100 psig (6.8 bar) the evaporator fan will start 10 seconds after compressor start. If suction pressure is above 100 psig (6.8 bar) the fan start will be delayed until suction pressure is below 100 psig (6.8 bar) or until 20 seconds has elapsed.

4.3.2 Perishable And Frozen Set Point Ranges.

There are two ranges defined for set point.

a. Perishable Range = set points above +10.4°F (-12°C).

b. Frozen Range = set points of or below +10.4°F (-12°C).

4.3.3 Pull Down/Pull-Up

When in Pulldown, the refrigeration system will operate with the compressor loaded (six cylinders), the EVXV controlling superheat to allow maximum flow, and (in Engine Operation) in high speed.

When in Pull-Up, and Engine Operation, the engine will operate in high speed.

Pulldown/Pull-Up will be entered:

- following a Start-Up.
- following a set point change.
- following an operational change (Start-Stop Operation vs Continuous Operation or Engine Operation vs Standby Operation).
- following a defrost termination.
- when in a Start-Stop ON Cycle and all other Stop Parameters have been met except the compartment temperature Stop Parameter.

Pulldown/Pull-Up will end when one of the following occurs:

- when in Engine Operation and the microprocessor is calling for low speed due to an override or Configuration Setting.
- when in Start-Stop Operation and the compartment temperature Stop Parameter has been satisfied while one or more of the other Stop Parameters has not.
- If in Continuous Operation - perishable and the High Speed Pulldown Configuration is OFF and the temperature is in the required range Pulldown Mode ends.
- If in Continuous Operation - perishable and the High Speed Pulldown Configuration is ON: when the temperature is equal to or less than 0.36°F (0.2°C) above set point.

4.3.4. Defrost

Refer to Section 4.6 for a description of defrost.

4.3.5. Overrides

With the complex control systems in use with the Advance microprocessor there are many user selected and preprogrammed software overrides and Configuration settings which may change the operation of the unit. Refer to Sections 4.7 & 4.8 for complete descriptions of these features.

4.4 START-STOP OPERATION

Start-Stop is provided to reduce fuel or power consumption. This feature allows full automatic control of the unit by monitoring compartment temperature, battery condition and (when in Engine Operation) engine coolant temperature.

The main function of Start-Stop Operation is to shutdown the engine or compressor after certain conditions are met (to provide an efficient temperature control system) and to initiate a restart sequence after certain conditions are met. The Start-Stop/Continuous key is pressed to select between Continuous and Start-Stop Operation. The corresponding LED will be illuminated.

NOTE

The microprocessor may be locked so that the unit will always operate in Start-Stop whenever the set point is within a specific range. Refer to Range Lock (Section 4.7.2) for additional information.

4.4.1 Start-Stop Configuration

Microprocessor control of Start-Stop Operation is dependent on both Configuration and Functional Parameter settings. The first setting to be considered is the START-STOP PARAMETERS Configuration. This setting determines control actions when in the Perishable Range or Frozen Range. The available settings are TOGETHER and SEPARATE.

- When SEPARATE is chosen the control action will be different, depending on whether the set point is in the Perishable Range or in the Frozen Range (refer to Section 4.3.2).
- When TOGETHER is chosen, the same settings apply to any set point.

If **TOGETHER** is selected, then the following Functional Parameter values will be available for use:

- MINIMUM RUN TIME
- MINIMUM OFF TIME
- RESTART TEMPERATURE
- OVERRIDE TEMP
- MAXIMUM OFF TIME
- FROZEN SHUTDOWN OFFSET

If **SEPARATE** is selected, then the following Functional Parameter values will be available for use:

- PERISHABLE MINIMUM RUN TIME
- PERISHABLE MINIMUM OFF TIME
- PERISHABLE RESTART TEMPERATURE
- PERISHABLE OVERRIDE TEMP
- PERISHABLE MAXIMUM OFF TIME
- FROZEN MINIMUM RUN TIME
- FROZEN MINIMUM OFF TIME
- FROZEN RESTART TEMPERATURE
- FROZEN OVERRIDE TEMP
- FROZEN MAXIMUM OFF TIME
- FROZEN SHUTDOWN OFFSET

NOTE

In the event that this Configuration was set to SEPARATE and the ten Functional Parameters for Perishable and Frozen have been set and then the Configuration is changed from SEPARATE to TOGETHER. The values from the Perishable settings will be the ones that will be used.

4.4.2 Stop Parameters

Whenever the unit starts in Start-Stop Operation, it will remain in the Start-Stop ON cycle until **all** five of the following criteria have been satisfied:

1. It has run for the selected Minimum Run Time

The MINIMUM RUN TIME is selected in the microprocessor Functional Parameters. The purpose of this is to force the unit to run long enough to completely circulate the air inside the compartment, and to ensure that the product temperature is at set point. This value may be set from 4 to 60 minutes in 1 minute intervals. The factory default setting is 4 minutes.

If all Start-Stop parameters required to enter a Start-Stop Off cycle have been met except this parameter, the unit will operate with the compressor and heaters off and the evaporator fan running until this parameter has also been met.

2. The engine coolant temperature has warmed

Each time the unit is started in Engine Operation it must continue to run until the coolant temperature rises to 122°F (50°C) to ensure it has fully warmed up before shutdown is allowed.

If all Start-Stop parameters required to enter a Start-Stop Off cycle have been met except this parameter, the unit will operate with the compressor and heaters off and the evaporator fan running until this parameter has also been met.

3. The battery is fully charged - Voltage

A good battery is defined as having 13.4 VDC at 77°F (25°C). The microprocessor will calculate the equivalent voltage based on the ambient temperature and shutdown will be allowed when battery voltage is at or above the calculated value.

TIP

When the microprocessor is powered up, the status of the unit battery can be readily checked by reading the Battery Voltage in the Data List. If “OK.” appears after the voltage reading, battery voltage is sufficient to allow the unit to cycle off.

If in Engine Operation and all Start-Stop parameters required to enter a Start-Stop Off cycle have been met except this parameter, the unit will operate with the compressor and heaters off and the evaporator fan running until voltage is greater than 13.4 VDC or for 20 minutes.

If in Standby Operation and the compressor has cycled off a PSCON relay will energize (to supply power to the battery charger) until battery voltage is 13.4 volts or 20 minutes has elapsed.

4. The battery is fully charged - Amperage

The microprocessor monitors the charging current. Once the charging current drops below the selected value, shutdown will be allowed. The CURRENT FOR START-STOP SHUTOFF is selected in the microprocessor Configurations The value may be set from 1 to 10 amps in 0.5 amp intervals. The factory default setting is 7 amps.

If in Engine Operation and all Start-Stop parameters required to enter a Start-Stop Off cycle have been met except this parameter, the unit will operate with the compressor and heaters off and the evaporator fan running until the charging current drops below the selected value.

If in Standby Operation and all Start-Stop parameters required to enter a Start-Stop Off cycle have been met except this parameter, the unit will enter the Off cycle. In the Off cycle, the PSCON relay remains energized, supplying power to the battery charger. The battery charger will continue to charge the battery if required.

5. The compartment temperature requirement is satisfied

In Start-Stop Operation the refrigeration system will operate in Pulldown or Pull-Up Mode in order to reach the shutdown condition as quickly as possible.

Shutdown will be allowed when the compartment temperature is within 0.5°F (0.3°C) of set point, for operation in the Perishable Range. In the Frozen Range, shutdown will be allowed when the compartment temperature is calculated to be within 0.5°F (0.3°C) minus the FROZEN shutdown OFFSET of set point.

The FROZEN shutdown OFFSET Functional Parameter may be set from 0 to 3.6°F (0 to 2°C) in 0.5°(C or F) increments. The factory default setting is 0°F (0°C).

If the temperature requirement has been satisfied while one of the other shutdown requirements has not been met, the unit will remain in operation with the compressor and heaters off and the evaporator fan running until that Parameter has also been met.

4.4.3 Re-Start Parameters

While the unit is in a Start-Stop OFF Cycle, restart will be initiated when **one** of the following conditions occurs:

1. Engine coolant temperature drops below selected microprocessor Configuration value

If in Engine Operation, the microprocessor will monitor coolant temperature. If coolant temperature drops below the ENGINE TEMPERATURE FOR RESTART Configuration value the engine will be started. The Configuration value may be set from 10 to 32°F (-12.2 to 0°C) in 0.5°(C or F) increments. The factory default setting is 32°F (0°C).

2. Battery voltage falls below selected microprocessor Configuration value

The microprocessor will monitor battery voltage. If battery voltage is at or below the VOLTAGE FOR START-STOP RESTART Configuration value the engine will be started **or,** when in a Standby Operation OFF Cycle, a PSCON relay will energize (to supply power to the battery charger) . The value may be set from 12.0 to 12.8 volts. The factory default setting is 12.2 volts.

TIP

When the microprocessor is powered up, the status of the unit battery can be readily checked by reading the Battery Voltage in the Data List. If "OK." appears after the voltage reading, battery voltage is sufficient to allow the unit to cycle off.

3. The Maximum Off Time has expired

In some ambient conditions there are times when the unit may remain in a Start-Stop Off cycle for extended periods of time. To ensure that the entire load stays within the normal restart temperature range, the MAXIMUM OFF TIME Functional Parameter may be used to force the unit to restart - in low speed) with the evaporator fans operating to ensure there are no hot spots and the temperature sensor is accurately reflecting the temperature of the product. The parameter value may be set to OFF **or** from 10 to 225 minutes in 1 minute intervals.

If the MAXIMUM OFF TIME is OFF, there is no maximum off time for Start-Stop and the unit will remain off. The factory default setting is OFF.

4. The Minimum Off Time has expired

The MINIMUM OFF TIME Functional Parameter setting allows the unit to remain off for extended periods of time, maximizing fuel/power economy. The unit may not be restarted until the MINIMUM OFF TIME has expired **and** the compartment temperature is greater than the PERISHABLE RESTART value selected in the Functional Parameters away from set point. In the Frozen Range, restart is allowed when the compartment temperature is greater than the FROZEN RESTART value above set point.

The MINUMUM OFF TIME parameter value may be set from 10 to 90 minutes in 1 minute intervals. The factory default setting is 20 minutes. The RESTART TEMPERATURE value may be set from 0.5 to 18°F (2 to 10°C) in 0.5 (F or C) increments. The factory default is 5.5°F (3°C).

5. Compartment temperature has exceeded the Override Functional Parameter value

During MINIMUM OFF TIME the microprocessor continually monitors the refrigerated compartment temperature. If the temperature should drift outside the START-STOP OVERRIDE TEMPERATURE Functional Parameter value the unit will be restarted. The value may be set from 3.6 to 18°F (2 to 10°C) in 0.5° increments. The factory default setting is 11°F (6°C).

Whenever the unit restarts, temperature control will be in the PullDown or Pull-Up mode (refer to Section 4.3.3).

4.5 CONTINUOUS OPERATION

4.5.1. Introduction

In Continuous Operation, the unit will not shutdown except in response to a shutdown alarm. Temperature control in the compartment will operate under Pulldown, Pull-Up, Cooling, Heating or Null.

Continuous Operation is normally used for fresh produce and other sensitive product loads. The Start-Stop/Continuous key is pressed to switch between Continuous Operation and Start-Stop Operation. The corresponding LED will be illuminated.

NOTE

The microprocessor may be locked so that the unit will always operate in Start-Stop or in Continuous whenever the set point is within a specific range. Refer to Range Lock (Section 4.7.2) for additional information.

4.5.2. Continuous Operation

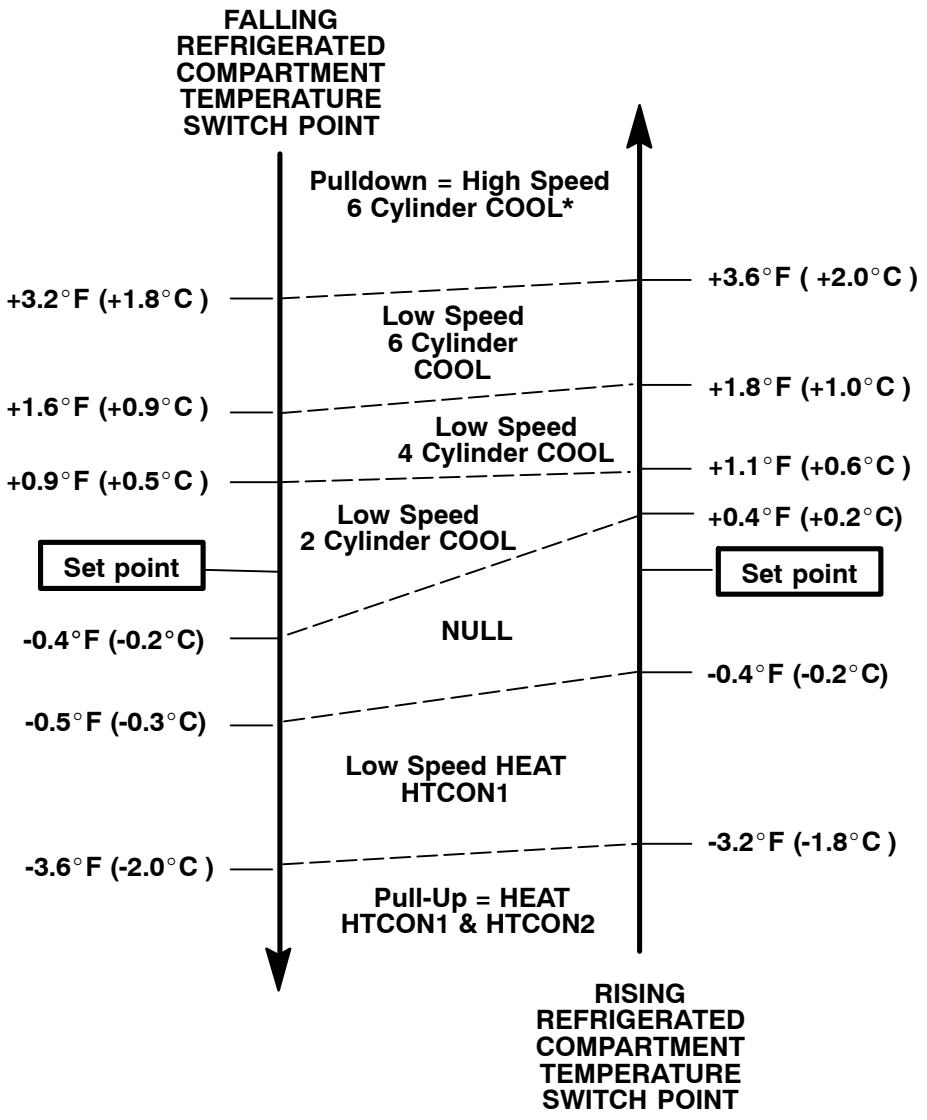
Refer to Figure 4–2 and Figure 4–3 for the Switch Point temperatures at which speed changes, unloading changes, heater operation and change to Null Mode occur while operating in Continuous Operation.

The switch points will differ depending on the setting of the microprocessor ECO MODE Functional Parameter. This value may be set to YES or NO. The factory default setting is NO. With ECO MODE set to NO, the microprocessor will control temperature closer to set point, yielding maximum product protection. With ECO MODE set to YES, the microprocessor uses the Start Stop Override Functional Parameter setting (even though the unit is in Continuous Operation) and will control temperature within a wider band, yielding improved fuel economy.

When neither heating or cooling is required the unit will enter Null Mode. In Null Mode, the electronic expansion valve (EEXV) is closed to 0% while the evaporator fan(s) continue to run.

When Null Mode is required and the system is operating in:

- Engine Operation, the compressor will shutdown while the engine, condenser fan and evaporator fan will continue to operate.
- Standby Operation, the compressor will shutdown while the evaporator fan will continue to operate.

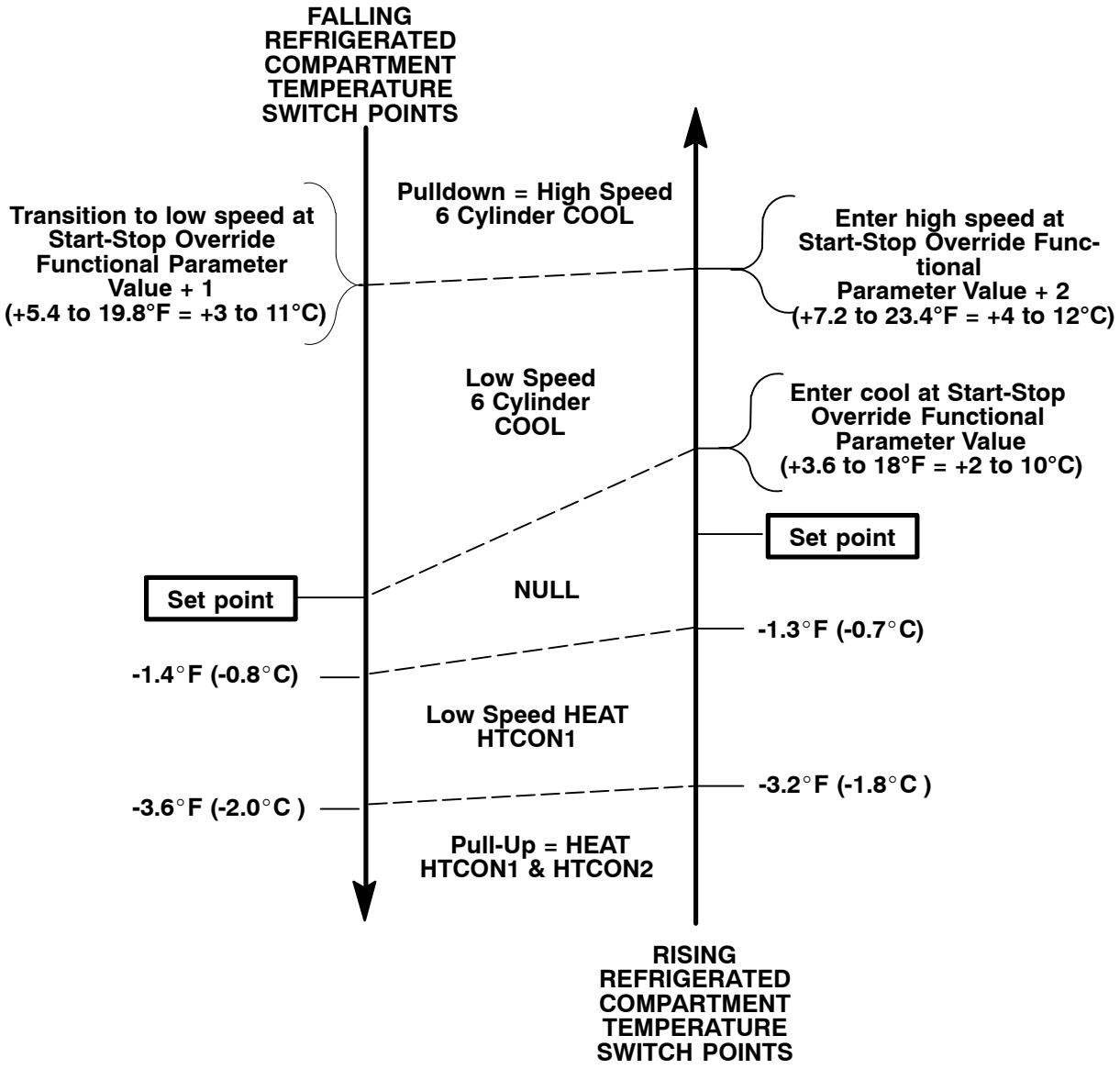


Switch Point = Controlling Temperature - Set Point
+ results are above set point, - results are below set point

Switch points are the same for Perishable Range and Frozen Range except in Frozen Range heating is not allowed.

*** If the HIGH SPEED PULLDOWN Configuration is set to YES, transition from pulldown is delayed from the indicated +3.2°F (+1.8°C) transition temperature until the temperature is +0.36 °F (+0.2°C) above set point.**

Figure 4–2 Continuous Operation Switch Points with Eco Mode set to NO



Switch Point = Controlling Temperature - Set Point
+ results are above set point, - results are below set point

Switch points are the same for Perishable Range and Frozen Range except in Frozen Range heating is not allowed.

Figure 4–3 Continuous Operation Switch Points with Eco Mode set to YES

4.6 DEFROST

Defrost is an independent cycle overriding cooling and heating functions in order to de-ice the evaporator. When the unit is in defrost, the DEFROST LED will be on, the MessageCenter will display DEFROST CYCLE STARTED for 5 seconds. The center of the Main Display will show “dF”. However, defrost will not be allowed when the 1DDT is above 40.0°F (4.4°C).

4.6.1 Defrost Initiation And Start

Defrost can be initiated by pressing the MANUAL DEFROST key or automatically by the microprocessor. Microprocessor initiation is based on coil condition or expiration of the defrost timer.

a. Defrost based on coil condition

Defrost based on coil condition will be initiated when:

- blockage is sufficient to cause an air pressure differential across the coil great enough to close the contacts of the defrost air switch (DAS).

OR

- when the RAT - 1DTT temperature is greater than 36°F (20°C) for 15 continuous minutes. This method of defrost initiation will only be used for 3 consecutive defrosts. After three consecutive defrost initiations by this method the counter will be reset to allow this defrost initiation again only after a defrost cycle is initiated by another method (timer, air switch or manual).

TIP

Ice is not the only thing that will cause the air differential to increase across the evaporator coil. Shrink wrap, paper, plastic bags, and other such items when caught in the return air stream and pulled up against the evaporator coil or the return air grille can also cause the DAS contacts to close.

b. Defrost based on time:

Time interval between defrosts is selected in the microprocessor Functional Parameters. The parameter value may be set to 1.5, 3, 6, or 12 hours. The factory default setting is 6 hours.

NOTE

The defrost timer will not count when the unit is in defrost, the unit is in a Start/Stop off cycle or the 1DTT is greater than 40.0°F (4.4°C).

4.6.2 Defrost Modes

There are two defrost modes available, Normal Defrost and Natural Defrost:

NOTE

When the unit is in defrost and in Engine operation:

- the condenser fan will operate to supply air for the radiator.
- the engine will operate in high speed when the heaters are energized (to supply power for the heaters).
- the engine will operate in low speed when the heaters are de-energized.

a. Normal Defrost Mode

Normal Defrost Mode will be entered if RAT is less than 39.2°F (4.0°C) **and** SAT is less than 45.0°F (7.2°C). Defrost will be accomplished by shutting down the refrigeration system (which includes the evaporator fan) while the heaters are energized.

b. Natural Defrost Mode

Natural Defrost Mode uses a combination of the heat from the product and the electric heaters to melt any ice.

Natural defrost is available when:

- the Natural Defrost microprocessor Configuration is set to YES **and**
- defrost is initiated by closing of the DAS contacts with RAT greater than or equal to 39.2°F (4.0°C) **and**
- at least one normal defrost has been performed since power up.

When a natural defrost is initiated, the unit will operate for the first five minutes with the evaporator fan and HTCON2 de-energized and only HTCON1 energized. After 5 minutes the evaporator fan is energized while both HTCON1 & HTCON2 are de-energized.

Only 3 consecutive natural defrosts cycles are allowed. After there have been 3 consecutive natural defrost cycles, the next defrost will be a normal deforst.

4.6.3 Defrost Termination

When in normal defrost mode, defrost will terminate when the 1DTT rises to 55°F (12.8°C).

When operating in natural defrost, defrost will continue for a minimum of 5 minutes, a maximum of 10 minutes, or until the SAT is equal to or higher than the RAT.

When the unit exits defrost, the engine will go to low speed. “dF” will continue to be displayed in place of compartment temperature, and the COOL LED will come on when the compressor starts.

The EVXV will open, and the evaporator coil will begin to cool down. The evaporator fan will not come on right away, so that warm air is not blown into the refrigerated compartment, but will wait for the evaporator to cool down, up to a maximum of 8 minutes. Once the evaporator fan has started, “dF” will no longer be displayed, and refrigerated compartment temperature will again be shown in the main display.

If a 1DTT sensor alarm has been activated, defrost will terminate after 10 minutes.

NOTE

Defrost uses a Defrost Duration Timer that allows for a maximum of 45 minutes in defrost. If defrost is not terminated during the 45 minutes, the microprocessor will end the defrost cycle, and activate the A54 - “DEFROST NOT COMPLETE” alarm. When this occurs, the Defrost Interval Timer is set for 1.5 hours, at which time the unit will go into defrost again.

4.7. USER SELECTED OVERRIDE OPERATION

Three optional software override programs are available to the user. These programs include: Supply Air Limit Control, Temperature Range Lock and ProductShield. Information on how the unit operates under these programs is provided in the following sub-paragraphs.

4.7.1 Supply Air Limit Control

Supply Air Limit Control is available when the set point is at or between 32 to 65°F (0 to 18.4°C) and the unit is operating in cool.

Supply Air Limit is NOT a positive temperature control, drift above and below the Supply Air Limit will be seen as the system balances out.

Supply Air Temperature control will be accomplished by varying the position of the CSMV.

Supply Air Limit Configuration values can be set to allow for a different limit for Start-Stop than used in Continuous Run.

Supply Air Limit Control is set using the PERISHABLE SENSITIVE PRODUCT Functional Parameter (which can be set to OFF or ON), and the SUPPLY AIR LIMIT FOR START-STOP Operation Configuration or SUPPLY AIR LIMIT FOR CONTINUOUS Operation Configuration (each of which can be set from 0 to -21.6°F [0 to -12°C]).

NOTE

These values are all negative (except for 0), therefore, when the value is added to the set point, the result will be a temperature that is less than the set point.

When the PERISHABLE SENSITIVE PRODUCT Functional Parameter is set to OFF, the supply air temperature will be the coldest temperature of 32°F (0°C) OR the calculated value of Set Point minus the configured Supply Air Limit value.

When the PERISHABLE SENSITIVE PRODUCT Functional Parameter is set to ON, the supply air temperature will be the calculated value of set point minus the configured Supply Air Limit value.

Supply Air Limit controls the temperature of the supply air as it leaves the evaporator so that it does not go colder than the configured Supply Air Limit value below set point.

NOTE

The 9°F value used in the following examples is not necessarily a recommend setting, but is only used to show how the Supply Air Temperature Limit is calculated.

EXAMPLE 1: Perishable Sensitive Product Functional Parameter = **OFF**

Supply Air coldest temperature limit is the colder temperature of:

+32°F **OR**

Set point minus configuration value for Supply Air Limit

Sample Calculations:

Set point	50°F	45°F	40°F	33°F
Supply Air Limit Configuration Value	-9°F	-9°F	-9°F	-9°F
Set point minus Supply Air Limit	41°F	36°F	31°F	24°F
Coldest Supply Air Temperature allowed	32°F	32°F	31°F	24°F

EXAMPLE 2: Perish Sensitive Product Functional Parameter = **ON**

Supply Air will be limited to Set point minus configuration value for Supply Air Limit.

Sample Calculations:

Set point	50°F	40°F	33°F
Supply Air Limit Configuration Value	-9°F	-9°F	-9°F
Set point minus Supply Air Limit	41°F	31°F	24°F
Coldest Supply Air Temperature allowed	41°F	31°F	24°F

4.7.2 Temperature Range Lock 1 & 2

Range Lock is a group of Configurations which may be set to lock the unit into Start-Stop or Continuous Operation for various set point ranges.

Two ranges are available for selection Range Lock 1 and Range lock 2. Each Range can be independently set to lock it's set point temperatures into either Start-Stop or Continuous operation.

Each Range has it's own selectable minimum and maximum temperature, which define the span of the range. If some set point temperatures are contained in both ranges due to range overlap, Range 1 will always have priority over Range 2.

Typically, both Range Lock 1 and Range Lock 2 are used to control different set point ranges when IntelliSet is not active. For units with IntelliSet active, because each IntelliSet is generally programmed for a specific product, only Range Lock 1 is used to hold the unit in either the Start/Stop or Continuous Operation, and Range Lock 2 is left off.

For example (see Figure 4–4), if Continuous Operation is ALWAYS required whenever the set point is between 28°F and 55°F (-2.2°C and +12.8°C), Range 1 will be set for Continuous, with a Minimum Temperature of 28°F (-2.2°C) and a Maximum Temperature of 55°F (-12.8°C).

Should Continuous Operation ALWAYS also be required with set points between -22 and 0°F (-30 and -17.8°C), then Range 2 will be set for Continuous, with a Minimum Temperature of -22°F (-30°C) and a Maximum Temperature of 0°F (-17.8°C). Any set point outside of Range 1 or 2 will allow changes between Start-Stop and Continuous.

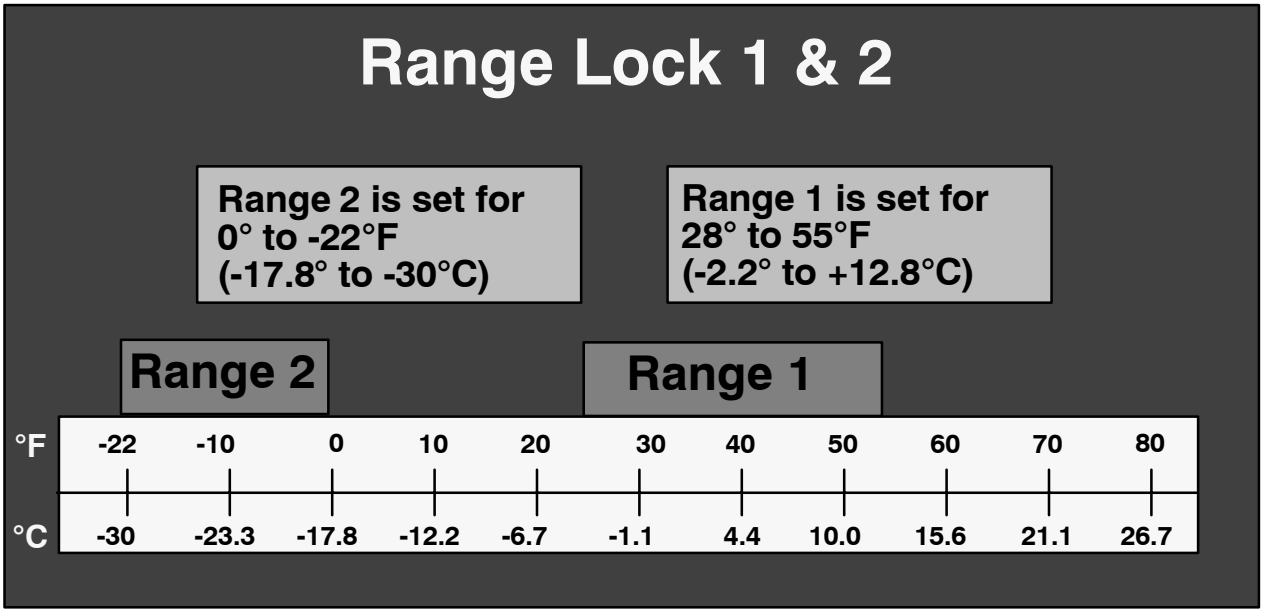


Figure 4–4 Range Lock Settings - Non Overlapping

The primary time that it is important to determine which range is to be Range 1 and which is to be Range 2 is when the ranges overlap each other.

In example 2 (see Figure 4–5), the ranges have been set to lock all set points into Start-Stop, except for a small range between +32° and +42°F (0° and 5.6°C) where the unit will always operate in Continuous. Range 1 Minimum Temperature has been set for +32°F (0°C), and Maximum Temperature of +42°F (5.6°C). Range 2 has been set for a Minimum Temperature of -22°F (-30°C) and a Maximum Temperature of +89.6°F (32°C). The unit will switch to Continuous when the temperature is between +32° and +42°F (0° and 5.6°C) because, when the ranges overlap each other the Range 1 settings will take priority.

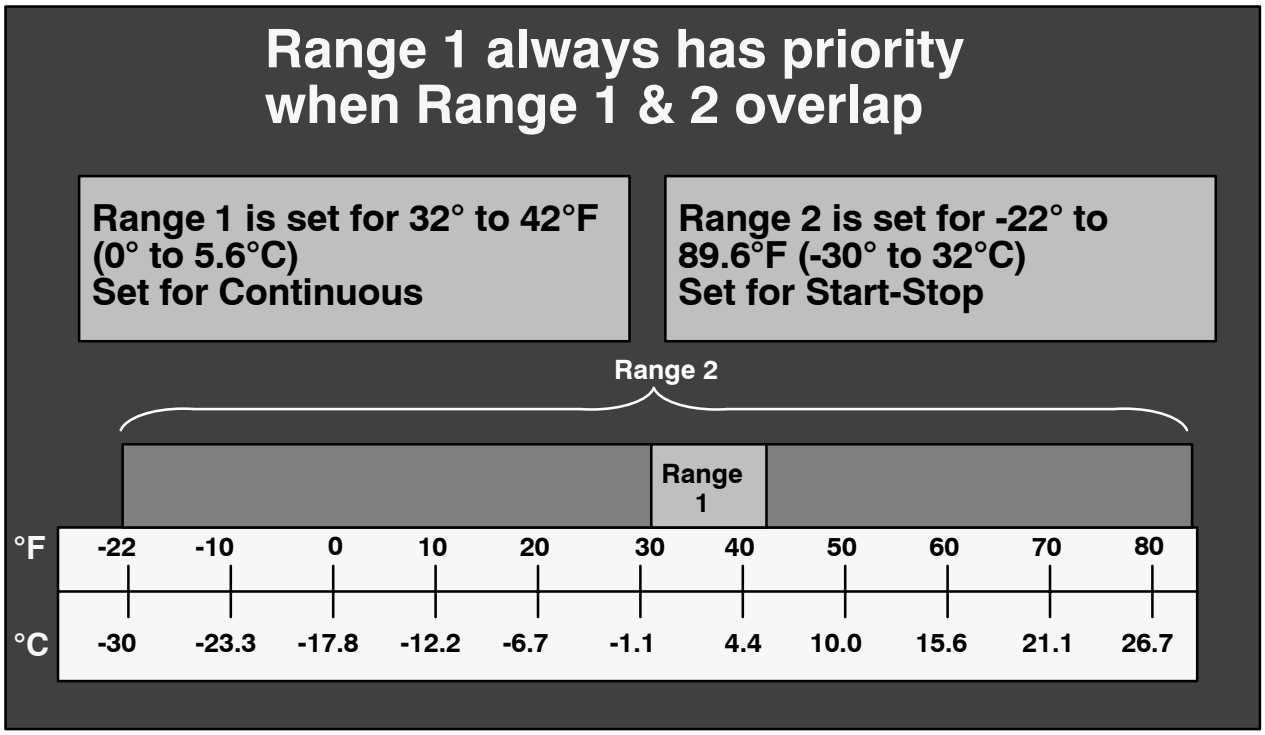


Figure 4–5 Range Lock Settings - Overlapping

4.7.3 ProductShield

ProductShield is a group of Configurations that work together to allow improved operating efficiency while providing customized product protection.

Each ProductShield setting allows the user to select an ambient temperature range in which to operate. The Minimum and Maximum range values can be set to OFF, or the allowed value range.

a. ProductShield: Econo

ProductShield Econo allows the microprocessor to automatically switch from Start/Stop Operation to Continuous Operation or vice versa. This allows maximum product protection while providing for power savings when ambient temperature is in the preset range.

ProductShield Econo - Go to Start-Stop Operation.

When the unit is set to Continuous Operation, ProductShield Econo allows the unit to run in Start/Stop Operation when:

- The ProductShield Econo Configuration is set to GO TO S/S **AND**
- The unit has run in Continuous Operation for a minimum of either 15 minutes, or the Minimum Run Time Functional Parameter setting (whichever time is longer) **AND**
- The ambient temperature falls **within** the pre-programmed temperature range **AND**
- The unit is not already running in ProductShield Winter. (See Section c.)

The operator can also pre-program a maximum evaporator coil temperature differential (delta-t) between the return air and supply air temperatures as an additional criteria for switching to Start/Stop Operation. The unit must bring the delta-t below this setting before going to Start/Stop Operation if this option is chosen.

NOTE

In ProductShield Econo: Go to Start/Stop, the delta-t must be lower than the value selected in order to enter Start/Stop.

Once the microprocessor detects that the above criteria have been met, the unit will switch from Continuous Operation to a Start/Stop Off Cycle for the MINIMUM OFF TIME Functional Parameter setting. During the Minimum Off Time, the RESTART OVERRIDE TEMPERATURE Functional Parameter setting can cause the unit to restart to protect the load. After the Minimum Off Time has expired the unit will return to Continuous Operation once, or if, the return air temperature is more than the configured perishable restart temperature away from setpoint in the perishable range, or the configured frozen restart temperature above set point in the frozen range.

When the unit restarts, it will return to Continuous Operation for a minimum of 15 minutes or the Minimum Run Time Functional Parameter setting, whichever time is longer. The original activation conditions must then be

met in order for the unit to return to ProductShield Econo: Start/Stop.

ProductShield Econo: Go To Start/Stop Examples:

The following examples apply in situations where all other Start/Stop conditions have been met.

Example 1 If the Minimum is set to 30°F (-1.1°C) and the Maximum is set to 40°F (4.4°C) and the *ambient air* temperature falls **between** these temperatures, the unit operation can change to Econo Start/Stop.

Example 2 If the Minimum is set to 30°F (-1.1°C) and the Maximum is set to OFF and the *ambient air* temperature is **above** 30°F (-1.1°C), the unit operation can change to Econo Start/Stop.

Example 3 If the Minimum is set to OFF and the Maximum is set to 40°F (4.4°C) and the *ambient air* temperature falls **below** 40°F (1.7°C), the unit operation can change to Econo Start/Stop.

Example 4 If both the Min and the Max are set to OFF, unit operation can change to Econo Start/Stop at any ambient temperature.

ProductShield Econo - Go to Continuous Operation.

When the unit is set for Start/Stop, ProductShield Econo allows the unit to run in Continuous Operation when:

- ProductShield Econo configuration is set to GO TO CONTINUOUS **AND**
- The unit has run in Start/Stop Operation for a minimum of 15 minutes OR the Minimum Run Time, Functional Parameter setting (whichever time is longer) **AND**
- The ambient temperature falls **outside** the pre-programmed temperature range **AND**
- The unit is not already running in ProductShield Winter. (See Section c.)

Once the microprocessor detects that the above criteria have been met, the unit will switch from Start/Stop to Continuous Operation for a minimum of 30 minutes. After 30 minutes the unit will return to Start/Stop if the ambient temperature enters the pre-programmed temperature range.

NOTE

Delta-t logic is not used or available when ProductShield Econo - Go To Continuous is active.

ProductShield Econo: Go To Continuous Examples

Example 1 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to 90°F (32.2°C) and the *ambient air* temperature falls **outside** these temperatures, the unit operation can change to Econo Continuous Operation.

Example 2 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to OFF and the *ambient air* temperature falls **below** 0°F (-17.8°C), the unit operation can change to Econo Continuous Operation.

Example 3 If the Minimum is set to OFF and the Maximum is set to 90°F (32.2°C) and the *ambient air* temperature falls **above** 90°F (32.2°C), the unit operation can change to Econo Continuous Operation.

Example 4 If both the Minimum and Maximum are set to OFF, ProductShield Econo: Go To Continuous can not operate as there is no range for the ambient to fall outside of.

b. ProductShield: High Air

ProductShield High Air allows the microprocessor to automatically switch the engine from normal to forced high speed, and thereby provide high evaporator air flow. This allows maximum product protection when certain conditions are met while providing for power savings when High Air is not required.

Operation in High Air is controlled by four Configurations; ProductShield High Air, High air Minimum Temperature, High Air Maximum Temperature and High Air Delta-T.

- The Product Shield High Air Configuration may be set to OFF or ON. ProductShield High Air is only active when the Configuration is set to ON.

- The High Air ambient air temperature range is defined by the High Air Maximum Temperature Configuration setting and the High Air Minimum Temperature Configuration setting. When a value is entered for both of these configurations, the unit will enter High Air when ambient temperature is above the high setting or below the low setting.

- When the High Air Maximum Temperature Configuration is set for a value and High Air Minimum Temperature Configuration is set to OFF, the microprocessor will switch to high speed operation when the ambient temperature is above the setting.

- When the High Air Minimum Temperature Configuration is set for a value and High Air Maximum Temperature Configuration is set to OFF, the microprocessor will switch to high speed operation when the ambient temperature is below the setting.

- When both the High Air Minimum Temperature Configuration and the High Air Maximum Temperature Configuration are set to OFF, ProductShield is not active.

- If a value is entered in the High Air Delta-T Configuration, the delta-t must be above the value before the microprocessor may switch to High Speed

Once the microprocessor determines that the pre-programmed criteria have been met, the unit will switch to High Air. The unit will continue to operate in High Air for a minimum of 30 minutes. After 30 minutes the unit will return to normal operation if the ambient temperature falls inside the pre-programmed temperature range by ±3.6° F (±2° C).

If the unit shuts down in Auto Start/Stop during High Air, it will not be in High Air when it restarts and will return to normal operation for a minimum of 15 minutes. The original activation conditions must then be met in order for the unit to return to high air.

ProductShield High Air Examples

Example 1 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to 90°F (32.2°C) and the *ambient air* temperature falls **outside** these temperatures, the unit operation can change to High Air Operation.

Example 2 If the Minimum is set to 0°F (-17.8°C) and the Maximum is set to OFF and the *ambient air* temperature falls **below** 0°F (-17.8°C), the unit operation can change to High Air Operation.

Example 3 If the Minimum is set to OFF and the Maximum is set to 90°F (32.2°C) and the *ambient air* temperature falls **above** 90°F (32.2°C), the unit operation can change to High Air Operation.

Example 4 If both the Minimum and Maximum are set to OFF, ProductShield High Air can not operate as there is no range for the ambient to fall outside of.

c. ProductShield: Winter

When the unit is set for Start/Stop operation, ProductShield Winter allows it to switch to Continuous Operation when the ambient temperature falls below the pre-programmed temperature. This helps protect the unit from the possibility of cold weather issues.

Once the microprocessor detects that the ambient temperature has dropped below the pre-programmed temperature, the unit will switch into ProductShield Winter which will force the unit to operate in Continuous Operation. The unit will continue to operate in Continuous Operation for a minimum of 30 minutes. After 30 minutes, the unit will return to auto Start/Stop if the ambient temperature has risen above the pre-programmed ProductShield Winter temperature.

NOTE

All of the ProductShield settings may be viewed in the Data List (Refer to Section 3.13). For units with IntelliSets, the Data List will reflect the ProductShield settings for the IntelliSet that is currently active.

4.8. PREPROGRAMMED SOFTWARE OVERRIDES.

4.8.1 Cargo Protect Mode.

The microprocessor will activate Cargo Protect Mode when both the A122 “CHECK RETURN AIR SENSOR” and A122 “CHECK SUPPLY AIR SENSOR” alarms activate.

- If the set point is in the perishable range (refer to Section 4.3.2), the unit will shutdown.
- If the set point is in the Frozen Range and the unit is in Engine Operation, the compressor will operate fully loaded and the engine will go to low speed.
- If the set point is in the Frozen Range and the unit is in Standby Operation, the compressor will operate unloaded.

The MessageCenter will display “WARNING: NO TEMPERATURE CONTROL” when the unit is operating in Cargo Protect Mode.

4.8.2 Compressor Minimum Operating Time

Each time the compressor is started it must operate for a minimum of 3 minutes before it can be de-energized.

If, during the 3 minutes, the unit is operating in the Frozen Range (refer to Section 4.3.2), it will continue to operate in cooling. If the unit is operating in the Perishable Range the unit will continue to cool with the heaters energized as required to maintain setpoint.

4.8.3 Engine Speed Overrides

This section lists the different factors that determine engine speed (high or low) in addition to the speed controls used in temperature control.

Speed Control Overrides in priority order are:

1. Forced Low Speed.

The microprocessor will force the unit to run in low speed when:

- When the ambient temperature is less than 0° F (-17.7° C) AND the unit is running in low speed heat with the AC current less than 8 Amps for 10 minutes the unit will remain in low speed until the ambient temperature is above 0° F (-17.7° C) OR the AC current is more than 8 amps for 10 minutes.
- When the ambient temperature is less than 0.°F (-17.7°C) AND the unit is running in either cool, null, or defrost AND AC current is less than 12 Amps for10 seconds, the engine will be forced to low speed. The unit will remain in low speed until the ambient temperature is above 0.°F (-17.7°C) OR the AC current is more than 10 Amps for 10 minutes.
- When the ambient temperature is less than 77°F (25°C) AND the unit is running in defrost AND the engine has been running less than 30 minutes since the Main Power switch was toggled from the OFF position, the unit will remain in low speed until the ambient temperature is above 77°F (25°C) OR the engine has run for a minimum of 32 minutes since the switch was toggled.

When the engine is forced to low speed under these conditions, the Message Center will display “FORCED LOW ENGINE SPEED”.

2. RAT & SAT Alarms.
When both the A122 “CHECK RETURN AIR SENSOR” and A122 “CHECK SUPPLY AIR SENSOR” alarms activate microprocessor control may enter Cargo Protect Mode. Refer to Section 4.8.1.

3. High Speed To Low Speed Delay.
When the engine is operating in high speed, and the microprocessor calls for low speed, the engine will remain in high speed for 40 seconds OR until the actual AC current is less than the configured Diesel or Standby Maximum Generator Amps value less the Diesel or Standby Offset Maximum Amps value.

4. Silent Mode.
When the Silent Mode Functional Parameter is set to ON, the unit will operate in low speed only.

5. Engine Coolant Warm-Up.
The engine will run in low speed until the coolant is above 79°F (26°C).

6. Defrost.

When the unit is in defrost:

- the engine will operate in high speed when heaters are energized (to supply power for the heaters).
- the engine will operate in low speed when the heaters are de-energized.

7. Door/Remote Switch Configuration.
If the Door/Remote Switch Configuration is set for low speed, the engine will run in low speed when the door/remote switch is open/active.

8. Start-Stop Restart.

If the engine is restarted from a Start-Stop off cycle for any reason except a Start-Stop Parameter Override Temperature the engine will operate in low speed until all conditions are met for another off cycle OR for the Minimum Run Time Functional Parameter value.

9. Low Speed To High Speed Delay.

- The compressor must operate for 2 minutes before transition to high speed is allowed.
- The time value entered in the High Speed Delay Configuration must be expired before transition to high speed is allowed.

10. Low Speed Startup.

The time value entered in the Low Speed Startup Minutes Functional Parameter (for Start-Stop or Continuous) must be expired before transition to high speed is allowed.

11. Frozen Set Point/Frozen Set Point Override.

If the set point is a frozen set point (below +10.4°F [-12°C]) and the temperature is below set point, the engine will operate in low speed.

12. Low Suction Pressure.

The microprocessor monitors the signal provided by the Suction Pressure Transducer. If the suction pressure falls below -2psig (-0.14 bar) for more than 20 seconds, the engine will operate in low speed for a minimum of 5 minutes, then remain in low speed until the suction pressure is greater than -2psig (-0.14 bar).

13. Operation With A Perishable Set Point.

If in Start-Stop Operation with a set point in the perishable range (above +10.4°F [-12°C]) and all conditions for an OFF Cycle have been met except for set point, the engine will operate in high speed to pull down to set point and cycle off quicker.

NOTE

Generally, the unit will go into an off cycle from high speed when this condition occurs. However, if one of the required conditions for shutdown is no longer met during this time, (for example, the battery voltage drops below the configured value, or the charging amps increase above the configured value, or the engine coolant temperature drops below 122°F (50°C), the engine may return to low speed operation until the shutdown condition is satisfied, then shutdown from low speed.

14. High Speed Pulldown.

If in Continuous Operation with a set point in the perishable range (above +10.4°F [-12°C]) and the High Speed Pulldown Configuration is set to YES, the engine will operate in high speed until the refrigerated compartment temperature is 0.36°F (0.2°C) above set point.

4.8.4 Unloader Control Overrides

This section lists the different factors that determine the operation (de-energizing / loading and energizing / unloading) of the unloaders in addition to the unloader control used in temperature control.

Unloaders operate in priority order for cooling ONLY (For example: Override 1 supersedes 2 and all lower overrides.):

The overrides will be allowed in Cargo Protect Mode only if the override does not use the return or supply temperature.

There is a minimum delay of 20 seconds between LOADING and UNLOADING cylinders under all operating conditions except when the engine is starting.

When the Compressor is Off the Unloaders are always de-energized.

NOTE

In all of the following instances UL1 refers to the Front Unloader and UL2 refers to the Rear Unloader.

1. Low Generator Amp Draw.

When the A128 - “LOW/UNBALANCED A/C AMPS” alarm is activated the compressor will only operate on 2 or 4 cylinders.

2. High Discharge Pressure Or High Generator Amp Draw.

The microprocessor will not allow additional cylinders to load whenever the compressor discharge pressure is above 415 psig (28.3 bar) OR when the compressor amp draw is within 1 Amp of the maximum allowable generator current (Maximum Allowable Generator Current is a Configuration Setting - Refer to 5.2.1.)

However, if the CDT is above 284°F (140°C) for more than 30 seconds at the same conditions, loading of one cylinder bank is allowed.

3. Compressor Restart.

The microprocessor will force the compressor to run in 2 cylinders for 10 minutes when the compressor restarts

unless the compressor is restarting following a defrost cycle. If the compressor discharge temperature (CDT) becomes greater than 284°F (140°C) or the system returns to Pulldown mode 10 minute will be overridden and the unloaders will de-energize (load) as required.

4. Fan Motor Delay.

Whenever any fan motor has been energized, there will be a 3 second delay before either unloader is allowed to de-energize (load).

5. Four Cylinder Delay.

When the compressor suction pressure (CSP) is greater than 22 psig (1.5 bar) AND the compressor is fully unloaded (operating on 2 cylinders), AND the conditions call for UL2 to be de-energized (loaded), there will be a 20 second delay while the CSMV closes down by 20% from the current setting. After UL2 loads the CSMV will go back to normal control.

6. Two-Minute Delay.

When an unloader is energized (unloaded) due to a refrigeration system pressure override (overrides #6, 7, 8 or 9), the unloader remains energized for a minimum of 2 minutes.

7. Compressor Startup.

- UL1 remains energized (unloaded) for a minimum of 10 seconds when the ambient is above 100°F (37.8°C) or 5 seconds when the ambient is at or below 100°F (37.8°C) after the compressor motor contactor is energized
- UL2 remains energized (unloaded) for a minimum of 60 seconds when the ambient is above 100°F (37.8°C) or 30 seconds when the ambient is at or below 100°F (37.8°C) after the compressor motor contactor is energized

8. High Evaporator Pressure.

UL2 will always be energized (unloaded) when the suction pressure is above the value shown Figure 4–6 for 1 minute, according to the current ambient temperature. For example, at an ambient temperature of 100°F (37.8 °C), UL2 will be energized when the suction pressure rises to approximately 75 psig (5 bar). UL2 can load as soon as the pressure is 5 psig (0.3 bar) less than the value in the chart.

9. High Discharge Pressure.

- If the compressor discharge pressure reaches 435 psig (29.6 bar) at some point soon after engine start up for more than 1 minute, UL2 will energize (unload) and remain energized until the compressor discharge pressure drops below 415 psig (29.6 bar).
- If both unloaders are energized (unloaded), and the discharge pressure drops below 430 psig (29.3 bar), UL1 will be de-energized (loaded)

10. Low Suction Pressure.

- If suction pressure falls below -2 psig or 4 inHg (0.14 bar) for more than 20 seconds, UL2 will be energized (unloaded)
- After 20 seconds: if suction pressure is still less than -2 psig or 4 inHg (0.14 bar), UL1 will be energized (unloaded), OR
- Once the suction pressure rises above 5 psig (0.3 bar), UL2 will be de-energized (loaded) (after the 2-Minute Delay mentioned above)
- If both unloaders are energized (unloaded), AND 20 seconds has elapsed since energizing (unloading) UL1 AND the suction pressure rises above 5 psig (0.3 bar), UL1 will be de-energized (loaded)

11. High CDT.

If the compressor is operating with both unloaders energized (unloaded), and the CDT rises to 284°F (140°C), UL1 will be de-energized (loaded), and will remain de-energized (loaded) until the CDT drops below 266°F (130°C) for at least 2 minutes.

12. Cargo Protect Mode.

Refer to Section 4.8.1

13. Start-Stop Operation.

If the Off Cycle conditions have been met in Start-Stop Mode (Refer to Section 4.4) and the minimum run time has expired, BUT compartment temperature is not at set point, both unloaders will be de-energized (loaded) and the compressor will operate on 6-cylinders until the unit cycles off.

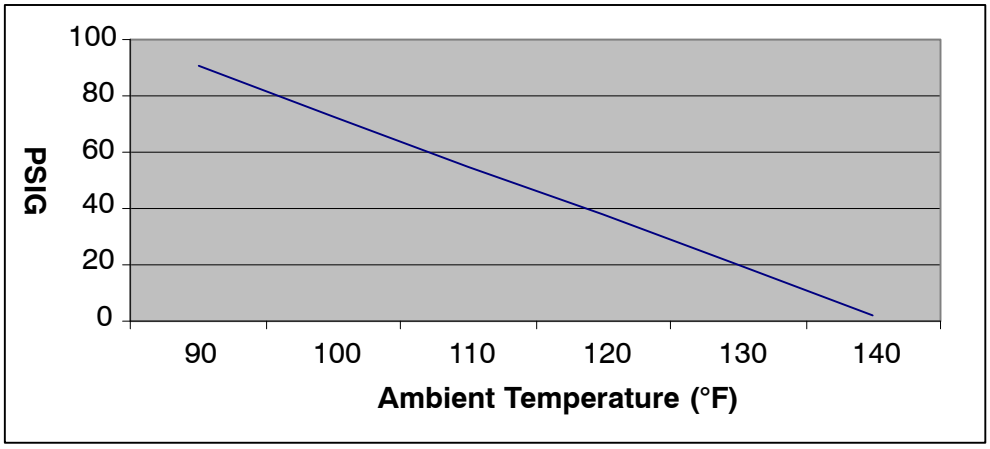


Figure 4–6 Evaporator Pressure Chart

14. High Speed Pulldown.

When the set point is in the perishable range, and the unit is operating in Continuous Run, and the High Speed Pulldown configuration is set for YES, then the compressor will operate with both unloaders de-energized (6-cylinder loaded operation) until the refrigerated container temperature is 0.36°F (0.2°C) above set point.

4.8.5 Defrost Safety Override

- When in defrost and the return air temperature rises to 95°F (35°C) regardless of the temperature of the DTT, the unit will go into low speed and all electric heaters will be de-energized. The unit will remain in defrost with the heaters de-energized until the return air temperature is less than 90°F (32°C).
- In addition, when in defrost and the supply air temperature rises above 135°F (45°C) regardless of the temperature of the DTT, the unit will go into low speed and all electric heaters will be de-energized. The unit will remain in defrost with the heaters de-energized until the supply air temperature is less than 108°F (42°C).

SECTION 5 – MICROPROCESSOR INTERFACE

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SECTION 5

MICROPROCESSOR INTERFACE

5.1 INTERFACE METHODS

There are five methods for interfacing with the Advance microprocessor;

1. Operator Interface - using the keypad.
2. Technician Interface - using the configuration jumper.
3. PC Mode - using the PC Mode jumper.
4. PC Card - Transferring data using a PC Card
5. ReeferManager & Reports - Access using a computer

Operator Interface such as start, stop, Pretrip, reading alarms, reading data and changing Functional Parameters may all be performed using the Keypad (refer to Section 3).

Technician Interface and PC Mode require the use of an additional connector before any actions may be performed and each allows increased interaction, including operations that may be performed with the microprocessor powered while the unit is shutdown.

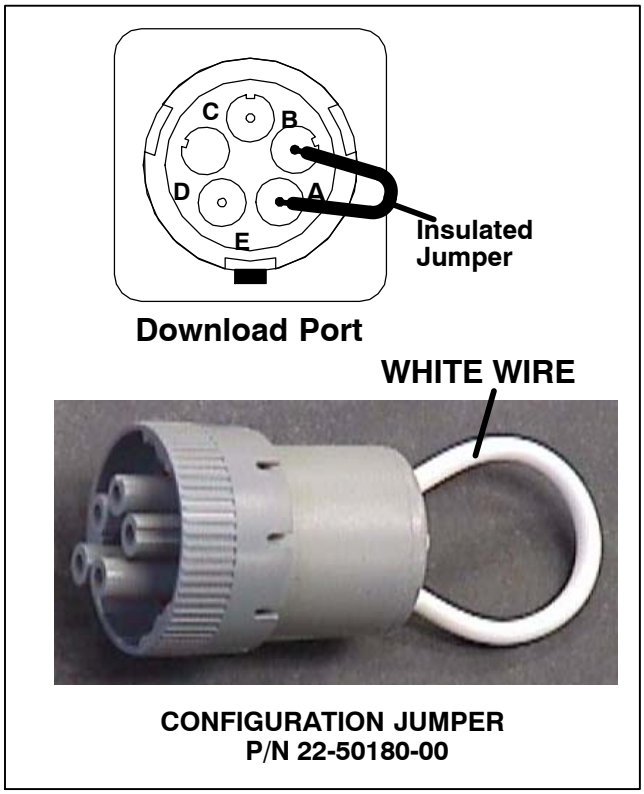


Figure 5–1 Technicians Interface Connection

5.2 TECHNICIAN INTERFACE (REMOVE JUMPER MODE)

The Technician Interface Mode allows the technician to change Configurations, test the unit components and/or service the refrigeration system. To place the microprocessor in the Technicians Interface Mode:

a. Place the Main Power switch in the OFF position.

b. Locate the serial download port (item 14, Figure 2–3) remove the protective plug to gain access to the wire terminals.

c. Plug in a Configuration Jumper or install an insulated jumper (see Figure 5–1).

NOTE

For units equipped with a switch labeled ENGINE/OFF/STANDBY (DOES):

The DOES may be placed in either the ENGINE or STANDBY position to enter the technician interface mode. If actual operation of the high voltage components (i. e. the evaporator fan motor) is desired, the power plug is to be connected and then the DOES is to be placed in the STANDBY position when entering the technician interface mode.

For units equipped with a switch labeled START/RUN-OFF (SROS):

The switch labeled STANDBY/ENGINE (DES) may be placed in either the ENGINE or STANDBY position to enter the technician interface mode. If actual operation of the high voltage components (i. e. the evaporator fan motor) is desired, the power plug is to be connected, the DES is to be placed in the STANDBY position and then the SROS is to be placed in the START/RUN position when entering the technician interface mode.

d. Place the Main Power switch in the desired position. The alarm LED will come on, the setpoint will display, but the refrigerated compartment temperature will not, and “REMOVE JUMPER” will display for 10 seconds. Remove the Configuration Jumper or insulated jumper at this time. The MessageCenter will then display “↑↓ TO SCROLL, THEN = TO SELECT” for 10 seconds.

e. Press the UP ARROW Key to scroll through the Menu beginning at the top.
Press the DOWN ARROW Key to scroll through the Menu beginning at the bottom.

f. Select the Mode you wish to access,

- **Configuration Mode**
- **Component Test Mode**
- **Service Mode**

and press the “=” key. Information on these test modes is provided in the following sub-paragraphs:

5.2.1 Configuration Mode

a. Enter the Technician Interface - Configuration Mode as described in Section 5.2.

b. To read through the Configuration list, press either the UP or DOWN ARROW keys. The list is circular, meaning that once the end is reached, it is repeated from the beginning. Refer to Table 5–2 for information on the settings and resultant microprocessor actions.

c. To change one of the Configurations, bring the desired Configuration into the MessageCenter, and press the "=" key. The MessageCenter will then display "↑ ↓ TO SCROLL, THEN = TO SAVE" for 10 seconds. Then the selected Configuration will flash, displaying the current selection. Press the UP or DOWN ARROW Key to scroll through the list of available selections for this Configuration.

d. Once the desired selection is displaying in the MessageCenter, press the "=" Key to save the selection. The MessageCenter will stop flashing. The new selection is now in memory.

e. Press the UP ARROW Key to continue to scroll through the Configuration list.

5.2.2 Component Test Mode

⚠ WARNING

If the unit is in Standby Operation and powered, voltage will be applied to high voltage components (i.e. the fan motor contactor) and those components will operate (i.e. the fan blades will turn) when those components are energized using Component Test Mode.

Component Test Mode allows the technician to energize individual circuits for 5 minutes at a time. The engine or compressor, when in Standby Operation, is not allowed to start when the microprocessor is in Component Test Mode. To enter the Component Test Mode:

a. Enter the Technician Interface - Component Test Mode as described in Section 5.2.

b. To read through the Component Test list, press either the UP or DOWN ARROW keys. The list is circular, meaning that once the end is reached, it is repeated from the beginning. Refer to Table 5–1 for a list of component tests available.

c. Once the desired test is displayed in the MessageCenter, press the "=" key to select that test. For example, if Buzzer is selected, the buzzer will come on, and "BUZZER OFF IN 5 MINUTES" will display in the MessageCenter. The minutes will count down to 0 at which time the buzzer circuit will be de-energized, and the MessageCenter will display the last component tested.

   Should you need more than 5 minutes, the timer may be reset for another 5 minutes anytime during the test by pressing the "=" key. The timer may only be reset once during each test. After the 5 minute timer expires, the MessageCenter will return to the Component Test Mode Menu, and display the last component tested.

   To retest the same component and circuit again, press the "=" key. Press the UP or DOWN Arrow key to select another component.

To stop an individual component test, press and hold the "=" key for 6 seconds. The microprocessor will still be in Component Test Mode, and ready for another component to be selected. To stop component testing, and turn the microprocessor off, place the Main Power switch in the OFF position.

To go to Configuration Mode or Service Mode, select Main Menu and press the "=" key.

The only keys that operate during Component Test Mode are the ALARM and SELECT keys. The alarm list is available for review of any active or inactive alarms. The SELECT key will only allow access to the data list Amp Draw information for the component that is currently being tested.

Table 5–1 Component Test

Component / Menu List	MessageCenter	FET	Board LED
Green Light	LIGHT OFF IN X MINS	7 & 14	
Amber Light	LIGHT OFF IN X MINS	14	
Defrost Light	LIGHT OFF X MINS	16	
Front Unloader (UL1)	UL1 OFF IN X MINS	23	
Rear Unloader (UL2)	UL2 OFF IN X MINS	22	
Speed Relay (SR)	SR OFF IN X MINS		27
Buzzer (B)	BUZZER OFF IN X MINS	18	
Glow Plug (Intake Air Heater) Relay (GP or IAHR)	RELAY OFF IN X MINS		30
Heater Contactor 1 (1HTCON1)	HEATER CONT 1 OFF IN 5 MINS	10	
Heater Contactor 2 (1HTCON2)	HEATER CONT 2 OFF IN 5 MINS	21	
Evaporator Motor Contactor (1EVCON)	EVAPORATOR CONT 1 OFF IN 5 MIN	20	
Power Supply Contactor Relay (PSCONR)	POWER SUPPLY CONT OFF IN X MIN	19	
Compressor Motor Contactor Relay (CCONR)	COMPRESSOR CONT OFF IN X MINS	2	
Condenser Motor Contactor (CDCON)	CONDENSER CONT OFF IN X MINS	1	
Generator Contactor Relay (GENCONR)	GENERATOR CONT OFF IN 5 MINS	3	
Main Menu (Press the "=" key to go back to the the Configuration Mode or Service Mode selection menu. Press the down or up arrow to continue scrolling the component test list.)			

5.2.3 Service Mode

⚠ CAUTION

Service Mode MUST be used whenever removing refrigerant charge, refrigerant leak checking or evacuating.

NOTE

If the Main Power switch is toggled to the OFF position, the microprocessor will exit service Mode.

To enter Service Mode:

a. Enter the Technician Interface - Service Mode as described in Section 5.2.

b. "ENTERING SERVICE MODE" will display in the MessageCenter.

When entering Service Mode the microprocessor opens the CSMV and EXV to 100% open.

c. Once the valves are open, "RECOVER / LEAK CHK / EVAC MODE" is displayed in the MessageCenter.

d. Refrigerant recovery, leak checking, or evacuation may be performed on the unit at this time. Refer to Service Procedures in Section 8.

e. The unit should remain in the RECOVER / LEAK CHK / EVAC MODE as these service procedures are performed. If the unit shifts to Charge Mode and "CHARGE MODE – HOLD = TO EXIT" is displayed in the MessageCenter, DO NOT perform refrigerant recovery, leak checking, or evacuation. Exit Service Mode and then re-enter, making sure that "RECOVER / LEAK CHK / EVAC MODE" is displayed in the MessageCenter before continuing any of these service procedures.

f. The microprocessor will monitor the pressure transducer readings during evacuation. Once all pressure transducers (CDP, CSP and EVOP) have dropped below –20 inhg (0.68 Bar) and then 2 of the 3 pressure transducers rise above 5 PSIG (0.34 Bar), the microprocessor will close CSMV and EXV to 0% open. When the valves are closed, "CHARGE MODE – HOLD = TO EXIT" is displayed in the MessageCenter. This action is taken to prevent refrigerant migration to the compressor during charging,

g. To exit Service Mode at any time, press and hold the "=" key for 3 seconds. "EXITING SERVICE MODE" will then display in the MessageCenter.

5.3 PC MODE

PC Mode allows the technician to access the microprocessor without the engine running and without the refrigeration system running. When in PC Mode the microprocessor is fully functional and all Operator Interfaces may be performed, the operation of the microprocessor may be demonstrated and all PC functions may be performed, again, without the unit actually operating.

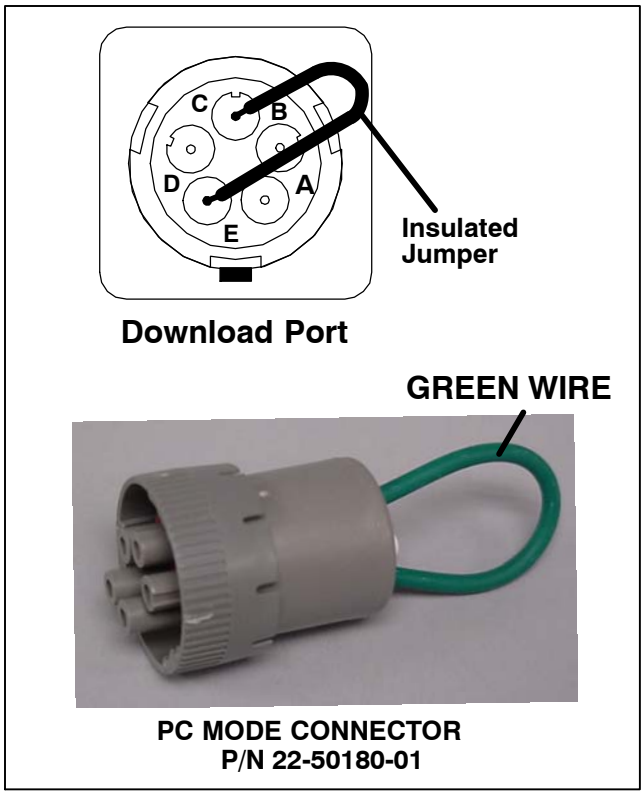


Figure 5–2 PC Mode Connection

To place the microprocessor in PC Mode:

a. Place the Main Power switch in the OFF position.

b. Locate the serial download port (item 14, Figure 2–3) remove the protective plug to gain access to the wire terminals.

c. Plug in a PC mode connector or install an insulated jumper (see Figure 5–2).

⚠ WARNING

Do not toggle the Main Power switch out of the OFF position when in PC Mode or the unit will start.

d. The microprocessor will be energized but the engine and refrigeration system will not be started.

e. When work is complete, remove the PC Mode connector. The microprocessor will return to normal operation when the Main Power switch is toggled out of the OFF position.

5.4 PC CARDS

PC Cards that are available include Program Cards, Configuration Cards, Option Cards and Download Cards. General instructions for using the cards is provided in Figure 5–3. Specific information on use is provided in the following sub-paragraphs.

NOTE

For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

5.4.1 Handling PC Cards

While these cards are not constructed for a rugged environment, they are not intended to be stored in a technician's toolbox, back pocket or on the dashboard of a vehicle.

The label on each card clearly states that the card is to be handled with care - not to be bent, dropped or exposed to impact. Heat, moisture and direct sunlight should be avoided.

PC cards are designed to be used in a wide temperature range of -40 to +185°F (-40 to +85°C). When a PC card is connected to an Advance microprocessor or computer at temperatures outside this range, data transmission between the card and the other device may not be performed correctly.

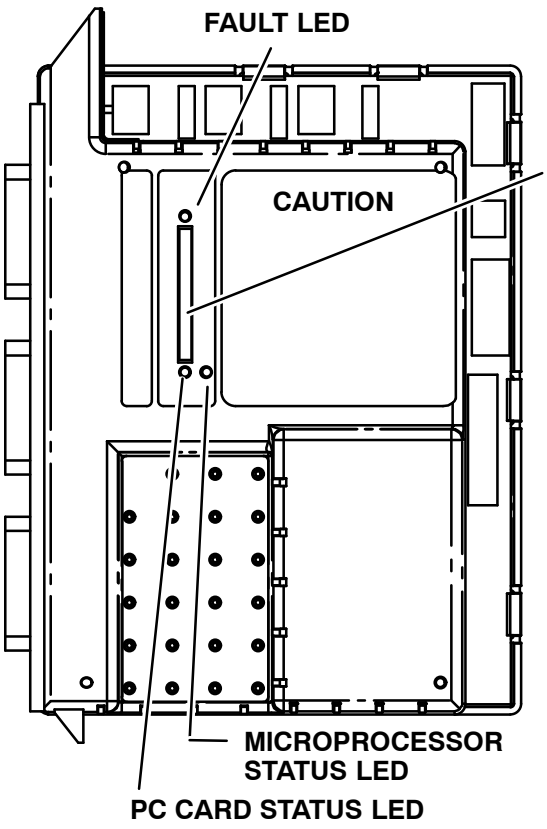
Retention of programmed data for extended periods of time requires a temperature range of -4 to +149°F (-20 to +65°C). When PC cards are exposed to temperatures outside of this range for several days data contained on the card may be damaged.

PC cards should never be:

- Dropped.
- Bent.
- Twisted.
- Squeezed.
- Submersed in any liquid.
- Exposed to electrostatic discharge.
- Exposed to intense ultraviolet light.
- Exposed to nearby magnetic or electromagnetic fields.

Low X-Ray exposure, i.e. that experienced while passing through a security screen, should not harm the card data. High X-Ray exposure, i.e. that experienced in a medical or dental environment may damage the card data. PC cards should not be exposed to magnets such as a pocket screwdriver with a magnetic end.

PC cards should be kept in a hard plastic jewel case when not in use. Replacement cases P/N 58-50109-00 are available from Carrier Transicold's Performance Parts Group.



1. Power the microprocessor by toggling the Main Power switch out of the OFF position or enter PC Mode (refer to section 5.3).
2. Insert the card into the PC card slot on the front of the microprocessor. Be certain that the instruction label is facing the "Caution" label. Do not force card into slot. Hold the card at the end opposite the plug end. DO NOT squeeze the card in the middle while inserting.
3. The MessageCenter will display messages while the required action is performed, the green PC CARD STATUS LED will flash. ***Do not remove the card until prompted to do so.***
4. When the required action is completed the PC Card Status LED will be on solid. The message center will display a "remove card message. The PC card may then be removed.
5. When the card is removed, the MessageCenter will return to the default message.
6. If any other messages display, refer to Section 6.1 MessageCenter for an explanation of the error message. If there is an error, the PC CARD FAULT LED will be on until the card is removed.

Figure 5–3 PC Card Interaction

5.4.2 Program PC Card

A program card is used to load software into the microprocessor. The card may contain any software version however, only one version may be loaded to the card at a time.

For complete instructions on loading data to the card using ReeferManager, refer to manual 62-10889. Software may be downloaded by a Carrier Transicold dealer from the TransCentral site.

TIP

Whenever performing a major operation to a microprocessor, such as installing new operating software, it is always a good idea to start the unit and give it a quick check over *prior* to performing the operation.

NOTE

Once the unit shuts down to begin the software install process, the Compressor Suction Modulation Valve closing process begins. The software installation processes will not begin until the CSMV is completely closed, which will delay the actual process for about 45 seconds.

⚠ CAUTION

The display and MessageCenter may behave differently during the software loading process, depending on the version of software currently in the microprocessor. DO NOT INTERRUPT THE SOFTWARE INSTALLATION PROCESS ONCE IT HAS STARTED. Also, do not place the Main Power switch in the OFF position during the initial power up following a software upgrade.

To load software from the card into the microprocessor, insert the card in accordance with the instructions provided in Figure 5–3.

When loading new software, the MessageCenter will display one of 3 different messages:

SAME SW: "= TO LOAD, ↑ TO CANCEL"
(The software loaded on the card is the same as the software presently in the microprocessor)
OLD SW: "= TO LOAD, ↑ TO CANCEL"
(The software loaded on the card is older than the software presently in the microprocessor)
NEW SW: "= TO LOAD, ↑ TO CANCEL"
(The software loaded on the card is newer than the software presently in the microprocessor)

NOTE

All units should have the microprocessor software upgraded to the latest production software, provided for Carrier Transicold dealers on the TransCentral site, except for those units that are listed in the “Field Test Software” section. For units listed in the “Field Test Software” section, ensure the latest software for that unit is installed.

Press the “=” key to load the software. The MessageCenter will display “ENGINE AND MICRO WILL STOP NOW” and the unit will shutdown. After about 45 seconds the MessageCenter backlight will dim and the message “INSTALLING PROGRAM SOFTWARE” will be displayed.

The microprocessor will continue and complete the software loading in accordance with the instructions provided in Figure 5–3.

5.4.3 Configuration PC Card

A configuration card may be loaded with Configuration or maintenance files for download to the microprocessor. The card may contain either type of file however, only one may be loaded to the card at a time.

NOTES

1. There can be a single complete DataLink data recorder and microprocessor setup placed on the card for setting up reefers. This is simply called creating a “Configuration Card”. Unit specific and time sensitive data cannot be loaded to a configuration card. This data includes: model number, serial number, hour meter readings, date and time. These configurations must be set using the keyboard or ReeferManager.

2. There can be certain individual microprocessor settings placed on the card for maintenance purposes. This is called creating a “Maintenance Card”.

To load a file from the card into the microprocessor, insert the card in accordance with the instructions provided in Figure 5–3.

Press the “=” key to load the file. The MessageCenter will display “LOADING INFO” while the FILE is being installed.

The microprocessor will continue and complete the loading in accordance with the instructions provided in Figure 5–3.

5.4.4 Option PC Card

Option PC Cards allow installation of optional programming into the microprocessor. Cards may be purchased with five or ten “clicks”. Each “click” allows downloading to an individual microprocessor. To transfer data from the card to the microprocessor, insert the card in accordance with the instructions provided in Figure 5–3.

Press the “=” key to load the option. The MessageCenter will display “INSTALLING OPTION, PLEASE WAIT” while the option is being installed.

The microprocessor will continue and complete the software loading in accordance with the instructions provided in Figure 5–3. In the “INSTALLED, REMOVE CARD XX” message displayed at the end of the loading process, the “XX” is the number of installs left on the card. A “click” will not be removed from the card if it is inserted into a microprocessor that already has the option installed.

5.4.5 Download PC Card

Download PC cards allow coping of data from the microprocessor DataLink data recorder to the card for use with the Reports feature of ReeferManager. To copy data from the microprocessor to the card, insert the card in accordance with the instructions provided in Figure 5–3.

When copying data to the card the MessageCenter will display COPING DATA - PLEASE WAIT”. When the copy is complete, the MessageCenter will display “COPY COMPLETE, REMOVE CARD X”. The “X” is the number or empty spaces remaining on the card.

NOTE

Only a copy of the data will be written to the card. The actual data will remain inside the DataLink data recorder.

For complete instructions on working with the data using the Reports program, refer to manual 62-10889.

5.5 REEFERMANAGER & REPORTS

5.5.1 Introduction

The ReeferManager & Reports program allows the user to access and download data, using a computer, when the unit is not running and without starting the eight-hour DataLink data recorder timer. Using the computer will provide additional programming and configuring capabilities that will not be available through the keypad. The DataLink data recorder may also be configured and downloaded using the ReeferManager program.

For complete instructions on using ReeferManager & Reports, refer to manual 62-10889.

NOTE

For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

a. ReeferManager

ReeferManager enables the user to do the following:

- Monitor in real-time via the download port (an RS-232 connection) the current status of the microprocessor inputs, outputs, refrigeration, electrical, engine and temperature sensors and alarms.
- Record sensor data to a file for diagnostic purposes.
- Download microprocessor and DataLink data recorder data via serial port communications directly to the computer.
- Display, edit and send unit model number, unit serial number and trailer ID to the microprocessor.
- Display, edit and send Functional Parameters and Configuration settings to the microprocessor and DataLink data recorder or to a PC Card.
- Write hour meter values to replacement microprocessors (during the first 25 hours).
- Initiate Pretrip and Defrost operations.
- Support Download, Configuration and Program PC Card operations.
- Provide a security log on system controlled by a System Administrator.

b. Reports

The Reports Program enables the user to do the following:

- Read .DCX download files from the Advance microprocessor
- Create various customized reports that include set point, sensors, and events
- Create various customized graphical reports
- Print numerical, graphical, and event reports
- View and print refrigeration system historical settings and changes
- Filter download data by date range and desired sensors and events
- Search for a sensor or event of interest
- Synchronize multiple graphical and numerical windows to better understand historical operation
- PC Setup enables the user to select how to display various parameters for use in the graph and text window.
- Easily adjust x and y axis and color scheme to accommodate various data
- Export data to a spreadsheet friendly format such as MS Excel.

NOTE

Beginning with Reefer Manger version 03.08.00, USB to RS-232 adapter cables are supported for communication between the PC and the Download connector. The USB – RS232 program must be installed from the CD-ROM, and the instructions that are included with the CD-ROM must be followed to successfully assign the USB driver to the correct USB port on the PC that will be used for the serial connection. Refer to bulletin SER09-033 for further information.

c. Connecting Computer and Microprocessor:

To connect the microprocessor and computer:

a. Locate the serial download port (item 14, Figure 2–3) remove the protective plug to gain access to the wire terminals.

b. Plug a download cable into the download port and computer connection (see Figure 5–4). Once the cable is connected to the download port, the microprocessor will power up, and display “PC MODE”

c. Start the ReeferManager & Reports program by double clicking on the icon on your computer desktop. For complete instructions on using ReeferManager & Reports, refer to manual 62-10889.

d. When work is complete, remove the download cable. The microprocessor will return to normal operation.



DOWNLOAD CABLE
P/N 22-01737-00 (6’ LONG)
OR
P/N 22-01737-04 (20’ LONG)

Figure 5–4 ReeferManager & Reports Connection

5.6 MICROPROCESSOR DISPLAY DIAGNOSTICS

Before replacing a microprocessor or display, the following procedure should be done to determine if the problem is with the microprocessor, display or interconnecting wiring.

NOTE

For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

⚠ CAUTION

Most electronic components are susceptible to damage caused by electrical static discharge (ESD). In certain cases, the human body can have enough static electricity to cause resultant damage to the components by touch. This is especially true of the integrated circuits found in the Advance microprocessor.

a. Attach a grounded wrist strap (CTD P/N 07-00304-00) and ground it to a good unit frame ground.

b. With the microprocessor powered up (check the Microprocessor Status LED - See Figure 2–9 - is blinking at a 1 second pulse) and without removing the spade connectors, check voltage between microprocessor terminal QC1 (+) and QC2 (-). Minimum voltage to microprocessor is 11 VDC. If voltage is not correct, repair wiring to microprocessor.

c. Unplug the 6MP connector from the microprocessor.

d. With the negative meter lead on QC2 (without removing the spade connector), test voltage at the microprocessor 6MP1 terminal, see Figure 5–5. If nominal 12 VDC is not present, the microprocessor has failed and must be replaced.

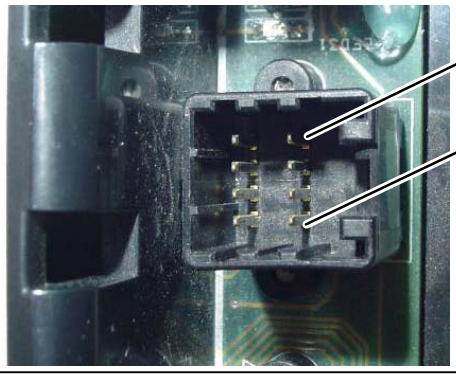


Figure 5–5 Connector 6MP Connections

e. With the negative meter lead on QC2 (without removing the spade connector), test voltage at the microprocessor 6MP4 terminal, see Figure 5–5. If nominal 5 VDC is not present, the microprocessor has failed and must be replaced.

f. Plug the 6MP connector back into the microprocessor.

g. Disassemble display to gain access to the display test points. Refer to Section 8.4.4 for display disassembly.

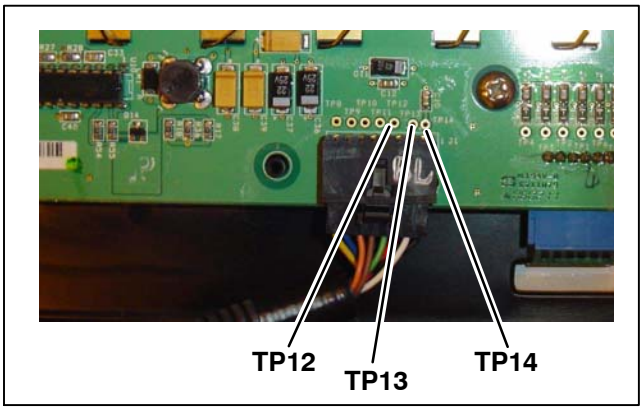


Figure 5–6 Display Test Points

h. With the negative meter lead on TP12, test voltage at TP14, see Figure 5–6. If nominal 12 VDC is not present, check wiring from microprocessor to display.

i. With the negative meter lead on TP13, test voltage at TP12, see Figure 5–6. If nominal 5 VDC is not present, check wiring from microprocessor to display.

j. If connections are good, replace the display board.

5.7 MICROPROCESSOR REPLACEMENT & SET-UP

⚠ CAUTION

Under no circumstances should a technician electrically probe the microprocessor at any point, other than the connector terminals where the harness attaches. Microprocessor components operate at different voltage levels and at extremely low current levels. Improper use of voltmeters, jumper wires, continuity testers, etc. could permanently damage the microprocessor.

Some microprocessor inputs operate at voltage levels other than the conventional 12 VDC. These inputs include but are not limited to the pressure transducers and temperature sensors. Under no circumstances should 12 VDC be applied at these connection points.

⚠ CAUTION

Most electronic components are susceptible to damage caused by electrical static discharge (ESD). In certain cases, the human body can have enough static electricity to cause resultant damage to the components by touch. This is especially true of the integrated circuits found in the Advance microprocessor.

Grounded wrist cuffs are available from Carrier (P/N 07-00304-00). These should be worn whenever handling a microprocessor.

Although there is less danger of electrical static discharge (ESD) damage in the outdoor environment or in a repair shop - where the processor is likely to be handled - proper board handling techniques should always be used. Advance Microprocessors should always be handled by the plastic cover and not the exposed printed circuit board. This not only precludes the possibility of ESD damage, but also lowers the possibility of physical damage to the electronic components.

When field diagnosis of a Carrier Transicold refrigeration unit determines that an Advance Microprocessor is not performing properly and must be replaced the replacement microprocessor must be setup for this unit and customer by entering the required Configurations, Functional Parameters and DataLink data recorder settings.

If the replacement microprocessor is not loaded with the most recent software, it should be updated. If software is loaded, it should be verified that it is the approved software for this model.

The preferred method for setup of the microprocessor is to use PC cards. All required changes, except unit specific and time sensitive data, may be performed using the cards. If cards are not available the microprocessor may be setup using ReeferManager. ReeferManager allows entry of all required data. If neither PC Cards or ReeferManager are available the microprocessor may be setup for immediate use using the keypad. Changes to the default DataLink data recorder settings may not be entered using the keypad, if the microprocessor is setup using the keypad, this feature will need to be loaded at a later date.

5.7.1 Pre-Replacement Steps

NOTE

For diagnoses of problems with the microprocessor, DataLink data recorder downloading, file analysis using Reports or use of PC cards, refer to Section 9.6

Before the unit can be started using the replacement microprocessor certain unit specific and time sensitive data must be known. That information includes:

- Unit Serial Number.
- Unit Model Number.
- Engine Protect Hours.
- Switch On Protect Hours.
- Engine Sleep Hours.
- Standby Hours.
- Switch On Sleep Hours.
- High Speed Hours.
- Start Cycles.
- Date and Time.
- ID Number.

a. If possible, power the original microprocessor up, by entering PC Mode, or by toggling the Main Power switch out of the OFF position.

b. Insert a Download PC Card into the PC Card slot and download all data from the DataLink data recorder If a Download Card is not available, data may also be downloaded using the ReeferManager PC Program.

c. Scroll through the data list and hour meter readings and make note of the unit specific data listed above. If the original microprocessor will not power up, gather the unit specific data from the model/serial number nameplate and estimate hour meter readings form the unit maintenance records. If PC Cards will be used to setup the replacement microprocessor, write the required data to the cards. Also, if the current configuration file is available for this customer from the TransCentral site, it should be downloaded and written onto the card prior to beginning work.

5.7.2 Microprocessor Replacement

a. Power down the microprocessor by removing the PC Mode connector and/or placing the Main Power switch in the OFF position.

b. Remove negative battery cable from battery.

c. Remove Connectors 1MP, 2MP, & 3MP from the outside of the Control Box.

d. Open the control box door.

e. Remove Connectors 4MP, 5MP & 6MP inside the Control Box. Remove all wires from the Microprocessor.

f. Locate wire to 80A fuse that runs through the current sensor. Note the orientation of the wire through the current sensor, to be certain that the wire is reinstalled through the new current sensor in the same direction. (Inserting the wire through the current sensor in the opposite direction will result in erroneous current readings.) Remove wire from fuse holder and gently pull through the current sensor.

g. Remove the screws holding the sides of the microprocessor into the control box. Remove the single screw holding the top of the microprocessor in place.

h. Pull the microprocessor back, and twist it out of the control box.

i. Install the new microprocessor by reversing the preceding steps

5.7.3 Microprocessor Setup

a. Ensure that the replacement microprocessor is in place, all wires connected and the negative battery cable is reconnected.

b. Power up the microprocessor by toggling the Main Power switch out of the OFF position. The microprocessor will immediately go into the Configuration mode.

c. Select the correct model family (Vector) and then enter the correct model number by using the UP or DOWN ARROW keys, scroll through the list until the correct Model Number appears (verify by reading the Model/Serial Plate on the unit). Press the = key to enter the new model number.

d. Press the UP ARROW key again, and the Unit Serial Number field will appear. Press the = key, then the UP ARROW key. You will see a blinking cursor in the field. Using the UP or DOWN ARROW key, scroll through the Number/Letter list, until the first letter of the serial number appears. Press the = key to enter that letter and advance the cursor to the next place. Repeat this process until the entire Unit Serial Number is entered. (i.e. MAL12345678).

e. Press the UP ARROW key again, and the ID field will appear. Press the = key, then the UP ARROW key. You will see a blinking cursor in the field. Using the Up or DOWN ARROW key, scroll through the Number/Letter list, until the first letter / number of the ID appears. Press the = key to enter that number / letter, and advance the cursor to the next place. Repeat this process until the entire ID number is entered. If the cursor is still blinking in a blank space after you are finished, slowly (wait 2-3 seconds between presses) press the = key to leave blanks in the remaining spaces. When you reach the end, the message "↑↓ TO SCROLL, THEN = TO SELECT" will display.

f. Now, press the DOWN ARROW key until "SET TIME" appears. Press the = key then the UP ARROW key to enter that menu.

⚠ CAUTION

When setting the microprocessor time, ensure that the clock you are using is accurate. Also, some customers are located in different time zones from the repair location. If you know the owners desired location time, enter that time. If you don't, enter the current time at your location.

g. When MONTH appears, press the = key, then the UP ARROW key. The MessageCenter will begin to flash, indicating that it is ready to accept changes. Use the UP or DOWN ARROW key to scroll through the number list until the correct number of the current month appears. Press the = key to enter that number for the month.

h. Press the UP ARROW key to go to Day.

i. Using the same key presses as in step g., continue to enter the correct numerical value for the Day, Year, Hour and Minute. Hours are displayed and entered as a 24 hour clock. 0 to 12 is AM. 13 to 24 is PM.

j. When you are finished, the MessageCenter will display "PRESS = TO SAVE TIME CHANGES".

NOTE

If you do not press the = key the time changes you just made will not be saved.

k. Press the UP ARROW key to go to "SET NEW HOURS". Press the = key then the Up Arrow key to enter that menu.

l. The first hour meter is Engine Protect Hours. Press the = key to select this meter. The cursor will be blinking on the ten-thousands place. Press the UP or DOWN ARROW key to select the correct value, then press the = key. If the correct number in any of the locations is 0 (zero), just press the = key to enter 0 as the value and move the cursor to the next place. For example, if you are entering 567 hours, you will press the = key twice to leave a 0 for the first two numbers, then use the UP and DOWN ARROW key to scroll through the numbers to enter the correct hours. When the correct hours for Engine Protect Hours has been entered, press the = key to advance to the next hour meter. If an invalid number is entered, a warning message will flash in the MessageCenter. For example, you can not enter a higher number of hours for Engine Protect than the number of Switch On Hours.

NOTE

None of the "Total" hour meters are listed. When the hours for all the hour meters are entered, the microprocessor will add the correct hours together and calculate the Total Engine Hours, Total Standby Run Hours and Total Switch On Hours. When the end of the list is reached "PRESS = TO SAVE HOURS" will be displayed. Pressing the = key will save the hours, and return you to the configuration list.

If you do not press the = key, none of the time hours or cycles you just entered will be saved.

Hour meters may be changed for 60 minutes following the initial hour entry. If an error has been made, be certain to correct it within the 60 minute time period. Following that time, the hour meters will count the appropriate hours because the unit switch is on and the unit is operating, and no further manual changes will be allowed.

NOTES

1. If a Configuration card will be used to setup the remainder of the microprocessor settings, proceed to Section 5.7.7 after the settings are entered.

2. After the unit specific and time sensitive configuration settings are complete use the UP or DOWN ARROW keys until “CONFIGS COMPLETE, = TO EXIT” is displayed in the MessageCenter. Press the = key to save.

3. If the Configurations, Functional Parameters and DataLink data recorder setup will be set from the keypad and /or ReeferManager, continue with following steps.

5.7.4 Configurations Via Keypad

a. Refer to Section 5.2 for a list of available microprocessor Configurations. Refer to Section 5.2.1 for instructions on how to access them.

5.7.5 Functional Parameters Via Keypad

a. Refer to Section 3.15 for list of available Microprocessor Functional Parameters and for directions on how to access them.

b. Leave the microprocessor powered up as you continue with the next section.

5.7.6 DataLink Data Recorder Via ReeferManager

NOTE

If the factory settings are used, you can skip this section.

a. Refer to Section 3.19 for list of DataLink data recorder setups.

b. Connect your computer to the download port of the unit and start the ReeferManager program (refer to Section 5.5 step c.). You will need ReeferManager version 03.08.00 or higher.

NOTE

ReeferManager 03.08.00 is REQUIRED in order to view, change and send new features to and from the microprocessor.

c. In ReeferManager, go to the Serial Operations Tab, and then click on Data Recorder/Microprocessor setup button.

d. Select the Sensors to be recorded and whether you wish averaged or snapshot recordings (averaged is recommended for all temperature sensors; snapshot is recommended for voltage, amperage, & RPM).

e. When the setup is correct, press the Send button to send the new settings to the microprocessor.

f. From the “Confirm Send Information” Pop Up, check the data you want to send and un-check the data you don’t want to send. Click the OK button.

g. Verify that the settings were sent by waiting for the confirmation pop up message.

NOTE

If the DataLink data recorder date and time were not set earlier, they can be set from this screen by clicking on Tools>Set Date and Time.

5.7.7 Microprocessor Final Checkout

a. Start the unit and allow it to run for a few minutes.

b. While the unit is running, scroll through the Data List of the microprocessor. Verify that all the data is now accurately displayed.

c. Initiate a Pretrip test. Allow the unit to complete the Pretrip and check for any alarms. Make any necessary repairs before returning the unit into service.

Table 5–2 Microprocessor Configurations

NOTE

Configurations are presented at the beginning of the list and progressing using the green UP arrow key

Configuration	Selections	Description
UNIT MODEL NUMBER #	Unit Family types, and then a list of configurable model numbers	Indicates to the microprocessor the model number of the unit. There are several model numbers provided in the list. Scroll to the Vector Family entries and select the model number printed on the Model/Serial Number nameplate.
UNIT SERIAL NUMBER #		The unit S/N may be entered. This may be up to 10 characters long. Numbers, Letters, and a space are available by scrolling through the available list.
TRAILER ID #		A customer assigned ID # may be entered. This may be up to 10 characters long. Numbers, letters, and spaces may be entered by scrolling through the available list. After selecting the desired characters, press SAVE to lock the characters in memory.
NOTE The default display for this Configuration is “TRAILER ID #”. The display may be modified if the “UNIT OPERATION’” Configuration is set to “RAIL”. If this Configuration is set to “RAIL” then “ASSET ID #” or “CAR ID #” may display rather than the “TRAILER ID #” default. Refer to the UNIT OPERATION Configuration later in this table.		
SET NEW HOURS	This Configuration will display when a replacement microprocessor is installed. It allows entry of the hours (from the existing microprocessor) into replacement microprocessor. This Configuration will only display until one of the hour meters reaches 25 hours. Changes to these values may be made for up to 60 minutes.	
GLOW TIME	SHORT LONG **INTAKE HEATER**	Indicates to the microprocessor which engine is in the system LONG = Glow Plug equipped and longer glow times are used (TV engines) SHORT= Glow Plug equipped and shorter glow times are used (DI engines) INTAKE HEATER = Intake Heater equipped (Tier 4 engines). NOTE: Refer to Table 4–1 for glow times.
OUT OF RANGE SHUTDOWN	YES / **NO**	YES = When the refrigerated compartment temperature has been out-of-range for 45 minutes, the alarm light will come on, and the unit will shutdown. NO = When the refrigerated compartment temperature has been out-of-range for 30 minutes, the alarm light will come on and the unit will continue to run. Refer to Alarm A53 - “BOX TEMPERATURE OUT OF RANGE” (Section 7) for more information.
PARAMETERS LOCKOUT:	YES / **NO**	YES = Functional Parameters cannot be changed using the keypad. NO = Functional Parameters can be changed using the keypad, unless individually locked out by Reefer Manager.

Table 5–2 Microprocessor Configurations - Continued

Configuration	Selections	Description
RPM ALARM SHUTDOWN:	**YES** / NO	YES = When the A39 - “CHECK ENGINE RPM” alarm is activated the alarm light will illuminate and the engine will shutdown. NO = When When the A39 - “CHECK ENGINE RPM” alarm is activated the alarm light will illuminate and the engine will continue to run.
LOW PRESSURE SHUTDOWN	**YES** / NO	YES = When the A18 - “LOW REFRIGERANT PRESSURE” alarm is activated the alarm light will illuminate and the unit will shutdown. NO = When the A18 - “LOW REFRIGERANT PRESSURE” alarm is activated the alarm light will illuminate and the unit will continue to run.
• LP SHUTDOWN DELAY	(0 - 255 seconds in 1 second increments) **255 SECS**	If the Low Pressure Shutdown Configuration is set to YES, shutdown is to be delayed for this amount of time after the Low Pressure Shutdown signal is received. USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING.
HIGH SUCT PRESS SHUTDOWN	**YES** / NO	YES = When the A27 - “HIGH SUCTION PRESSURE” alarm is activated the alarm light will illuminate and the unit will shutdown. NO = When the A27 - “HIGH SUCTION PRESSURE” alarm is activated the alarm light will illuminate and the unit will continue to run.
REFRIGERATION SYST SHUTDOWN	**YES** / NO	YES = When the A28 - “CHECK REFRIGERATION SYSTEM” alarm is activated the alarm light will illuminate and the unit will shutdown. NO = When the A28 - “CHECK REFRIGERATION SYSTEM” alarm is activated the alarm light will illuminate and the unit will continue to run.
SUCTION PRESSURE	**30 PSIG (2.0 BAR)** 0 - 50 psig (0 to 3.4 bar) [in 1 psig (0.1 bar) increments]	Pressure to maintain if discharge pressure transducer is opened or shorted.
COMPRESSOR ALARM SHUTDOWN (This Configuration is an option, it will not display if the option is not installed.)	**YES** / NO	If the “Compressor Alarm Shutdown” option has been installed (refer to Unit Data), this setting will be available. YES = The unit will shutdown and not restart when alarm A13, A17, A18, A27, A28 or A56 activate 3 times within 2 hours of continuous engine operation. NO = Normal shutdown rules for above alarms.
CURRENT FOR S/S SHUTOFF	**7.0A** 1A TO 10A (in 0.5A increments)	In Start-Stop Operation the charging current must drop below this value before the unit is allowed to shutdown.

Table 5–2 Microprocessor Configurations - Continued

Configuration	Selections	Description
VOLTAGE FOR S/S RESTART	**12.2V** 12.0 TO 12.8V	The engine will restart from a Start-Stop Off cycle or a Sleep Mode Off cycle when the battery drops to this value. A lower selection may result in a longer off cycle (based on battery voltage) and possibly overall shorter battery life. A higher selection may result in a shorter off cycle (based on battery voltage) and possibly overall longer battery life.
ENG TEMP FOR S/S RESTART	**10°F (-12.2°C)** 10°F to 32°F (-12.2°C to 0°C)	The engine will restart from a Start-Stop Off cycle or a Sleep Mode Off cycle when the engine coolant temperature drops to this value.
ALTERNATOR CHECK SHUTDOWN:	YES / **NO**	YES = When the A51 - “ALTERNATOR NOT CHARGING” alarm is activated the alarm light will illuminate and the unit will shutdown. NO = When the A51 - “ALTERNATOR NOT CHARGING” alarm is activated the alarm light will illuminate and the unit will continue to run.
BATT CHARGER (Applicable to unit - not lift gate - battery charger only.)	**NO TEMP SENSOR** WITH TEMP SENSOR	NO TEMP SENSOR = Use this setting when the battery charger does not have the temperature sensor wire. WITH TEMP SENSOR = Use this setting when the battery charger does have the temperature sensor wire (connected to the battery positive post).
ENGINE OIL LEVEL SWITCH	YES / **NO**	YES = An Engine Oil Level switch is installed. NO = An Engine Oil Level switch is not installed.
ENGINE OIL LEVEL SHUTDOWN	YES / **NO**	YES = When the A2 - “LOW ENGINE OIL LEVEL” alarm is activated the alarm light will illuminate and the unit will shutdown. NO = When the A2 - “LOW ENGINE OIL LEVEL” alarm is activated the alarm light will illuminate and the unit will continue to run.
LOW COOLANT LEVEL	YES / **NO**	YES = A Coolant Level Sensor is installed. NO = A Coolant Level Sensor is not installed..
ENGINE OIL PRESS SHUTDOWN	YES / **NO**	YES = When the A11 - “LOW ENGINE OIL PRESSURE“ alarm has been activated three times in the last two hours of engine operation the A21 _ “TECHNICIAN RESET REQUIRED“ alarm will be activated. NO = A21 will not be activated.
HIGH ENGINE TEMP SHUTDOWN	YES / **NO**	YES = When the A12 - “HIGH COOLANT TEMPERATURE” alarm has been activated three times in the last two hours of engine operation the A21 - “TECHNICIAN RESET REQUIRED“ alarm will be activated. NO = A21 will not be activated.

Table 5–2 Microprocessor Configurations - Continued

Configuration	Selections	Description
FUEL SENSOR	**NO DEVICE** SWITCH INSTALLED 0-5 VDC 0.25-4.75 VDC	NO DEVICE = There is no fuel level sensor installed in the fuel tank. SWITCH INSTALLED = A low fuel level switch is installed in the fuel tank. 0-5 VDC = An older style low fuel level sensor (5 bolt mounting flange) with a 0 to 5 VDC signal range is installed in the fuel tank. 0.25-4.75 VDC = A low fuel level sensor with a 0.25-4.75 VDC signal range is installed in the fuel tank. (Sensor with 1/2" MPT mounting or newer ultrasonic sensor.) If a low fuel level sensor (0 to 100% sensor) is installed, the low fuel level warning (Alarm 1) will come on when the level reaches 15% or less, and the unit will shutdown (Alarm 19) when the level reaches 10%.
FUEL TANK SIZE	**OFF** 30 Gallons 50 Gallons 75 Gallons 100 Gallons 120 Gallons	OFF = No fuel sensor is installed in the tank. 30 to 120 GALLON = Size fo fuel tank installed. (Refer to Fuel Sensor Configuration for additional information)
DIESEL MAX GEN AMPS	**25A** 10 TO 35 in 0.5A increments	Indicates to the microprocessor the maximum allowable amperage in Diesel operation. USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING.
STANDBY MAX GEN AMPS	**25A** 10 TO 35 in 0.5A increments	Indicates to the microprocessor the maximum allowable amperage in Standby operation. USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING.
STARTUP MAX GEN AMPS	**17A** 10 TO 35 in 0.5A increments	Indicates to the microprocessor the maximum allowable amperage during start up. USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING.
DIESEL OFFSET MAX AMPS	**4A** 0 TO 10 in 0.5A increments	The maximum allowable amperage in low speed operation will be the configured MAX GEN AMPS or MAX STANDBY AMPS less this value. USE FACTORY DEFAULT SETTING ONLY, DO NOT OPERATE UNIT WITH DIFFERENT SETTING.
STANDBY STARTUP DELAY	**OFF** 5 Seconds 10 Seconds 15 Seconds 20 Seconds	Indicates to the microprocessor the delay for this unit when starting in standby. This setting is used when multiple units are on the same line to stagger the occurrence of high inrush current in situations such as restart after a power loss.
DISPLAY TOTAL ENGINE HR	**YES** / NO	YES = This hour meter will be displayed during the startup messaging sequence and will be in hour meter menu. NO = This hour meter will not be displayed during the startup messaging sequence. It will be displayed with the "other meters and counters".

Table 5–2 Microprocessor Configurations - Continued

Configuration	Selections	Description
DISPLAY STANDBY RUN HR	**YES** / NO	YES = This hour meter will be displayed during the startup messaging sequence and will be in hour meter menu. NO = This hour meter will not be displayed during the startup messaging sequence. It will be displayed with the “other meters and counters”.
DISPLAY TOTAL SWITCH ON HR	**YES** / NO	YES = This hour meter will be displayed during the startup messaging sequence and will be in hour meter menu. NO = This hour meter will not be displayed during the startup messaging sequence. It will be displayed with the “other meters and counters”.
DIESEL RESET VALUE (Refer to Table 8–1 for oil/filter change intervals.)	**0FF** 50 TO 30,000 hours in 50 hour increments	When the engine maintenance hour meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm will be activated. If the value entered is “0” the alarm feature is turned off.
STANDBY RESET VALUE	**0FF** 50 TO 30,000 hours in 50 hour increments	When the standby maintenance hour meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm will be activated. If the value entered is “0” the alarm feature is turned off.
SWITCH ON RESET VALUE	**0FF** 50 TO 30,000 hours in 50 hour increments	When the switch on maintenance hour meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm will be activated. If the value entered is “0” the alarm feature is turned off.
PM 1 - 5 (Preventative Maintenance Hour Meters)	**OFF** ENGINE PROTECT HOURS SWITCH ON PROTECT HOURS STANDBY HOURS START CYCLES HIGH SPEED HOURS COMPRESSOR RUN HOURS MAINTENANCE DAYS	OFF = This selection will turn this meter OFF (will not display). ENGINE HOURS = this meter will count the engine hours until the next reset interval. SWITCH ON HOURS = this meter will count the switch on hours until the next reset interval. STANDBY HOURS = this meter will count the standby hours until the next reset interval. START CYCLES = this meter will count how many times the engine has started until the next reset interval. HIGH SPEED HOURS = this meter will count the number of hours the engine operated in high speed until the next reset interval. COMPRESSOR RUN HOURS = this meter will count the number of hours the compressor has operated until the next reset interval. MAINTENANCE DAYS = this meter will count the number of days until the next reset interval.

Table 5–2 Microprocessor Configurations - Continued

• PM 1 - 5 RESET INTERVAL Note: This Configuration will not display for those meters that are configured OFF.	**OFF** ENGINE PROTECT HOURS 0 or 50 TO 30,000 hours in 50 hour increments SWITCH ON PROTECT HOURS 0 or 50 TO 30,000 hours in 50 hour increments STANDBY HOURS 0 or 50 TO 30,000 hours in 50 hour increments increments START CYCLES 0 or 1,000 TO 90,000 CYCLES in 1,000 cycle increments HIGH SPEED HOURS 0 or 50 TO 30,000 hours in 50 hour increments COMPRESSOR RUN HOURS 0 OR 50 to 30,000 hours in 50 hour increments MAINTENANCE DAYS 0 OR 10 to 990 days in 10 day increments	The value to be entered here is the desired number of hours, cycles or days between PM Maintenance Alarms for this meter. When the meter is reset, the value selected here will be added to the to the present meter reading to indicate to the microprocessor when the next service interval alarm is to be activated. When a PM hour meter is configured as a Maintenance Days meter, that meter will not count a specific instance such as hours of operation or number of cycles for a particular component. The meter is connected to the real time clock and will activate the alarm after the entered number of days has elapsed.
PRODUCTSHIELD SETUP **NOTE:** Refer to Section 4.7.3 for more information on the following settings.		Press "=" to access the ProductShield menu. The information set in the following configurations can be read in the Unit Data list.
• PRODUCTSHIELD ECONO	**OFF** GO TO START/STOP GO TO CONTINUOUS	OFF = ProductShield Econo is OFF GO TO START/STOP = Allows unit to be set for and operate in Continuous Run until ambient temperature falls **within** a user-defined range when unit will go to START/STOP. This allows energy savings while offering Continuous Run operation protection when ambient is outside range. Unit will return to Continuous Run when ambient goes beyond range. GO TO CONTINUOUS = Allows unit to be set for and operate in START/STOP until ambient temperature falls **outside** a user-defined range when unit will go to Continuous Run. This provides continuous air flow and good product protection for extreme ambient temperatures. Unit will return to START/STOP when ambient comes back inside range.

Table 5–2 Microprocessor Configurations - Continued

•• PRODUCTSHIELD ECONO MIN TEMP	**OFF** or -20°F to +119.0°F (-28.9°C to +48.4°C) (in 0.5° increments) Default: **119.0°F (48.4°C)**	OFF = There is no lower limit for this parameter. Select the lowest ambient temperature desired to activate ProductShield Econo. If ProductShield Econo is Go To Continuous there is a minimum 10°F range. Therefore, this parameter's upper limit is ProductShield Econo Maximum Temperature minus 10°F (5.5°C).
•• PRODUCTSHIELD ECONO MAX TEMP	**OFF** or -20°F to +119.0°F (-28.9°C to +48.4°C) (in 0.5° increments) Default: **119.0°F (48.4°C)**	OFF = There is no upper limit for this parameter. Select the highest ambient temperature desired to activate ProductShield Econo If ProductShield Econo Install is Go To Continuous there is a minimum 10°F range. Therefore, this parameter's lower limit is ProductShield Econo Min Temp plus 10°F (5.5°C).
•• PRODUCTSHIELD ECONO - DELTA-T (used for "Go To S/S" only, not available for "Go To Cont")	**OFF** +3.6°F to +27.0°F (+2°C to 15°C) (in 0.5° increments	OFF = Delta-T is not used in determining when the unit will go into Econo: Go To Start/Stop mode. Select the desired delta-T value for activation of ProductShield Econo. When Delta-T is below this setting and within the minimum/maximum range, go to start/stop will be allowed
• PRODUCTSHIELD HIGH AIR	**OFF**	OFF = The unit will operate normally in high and low speeds.
	ON	ON = The unit will operate in high speed when the ambient air temperature is **outside** a user defined range. This provides increased air flow and good product protection for extreme ambient temperatures. Unit may return to low speed when ambient comes back within the range.
•• HIGH AIR MIN. TEMP	OFF	OFF = There is no lower limit for this parameter.
	-19°F to +119°F (-28.3°C to +48.3°C) in 0.5°F or °C increments Default: **119°F (48.3°C)**	Select the lower limit of the ambient range desired for this parameter. Refer to Section 4.7.3 for more information on High Air Min. Temp.
•• HIGH AIR MAX. TEMP	OFF	OFF = There is no upper limit for this parameter.
	-19°F to +119°F (-28.3°C to +48.3°C) in 0.5°F or °C increments Default: **119°F (48.3°C)**	Select the upper limit of the ambient range desired for this parameter. Refer to Section 4.7.3 for more information on High Air Max. Temp.
•• HIGH AIR DELTA-T	**OFF**	OFF = Delta-T is not used for determining the activation/de-activation of High Air Delta-T
	+3.6° F to +27.0°F (+2°C to 15°C) in 0.5° C or °F increments	Select the desired Delta-T value for activation of ProductShield High Air. Refer to Section 4.7.3 for more information on High Air Delta-T.
• PRODUCTSHIELD WINTER - XX°	**OFF** -20°F to +32.0°F (-28.9°C to 0°C) (in 0.5° C or °F increments	Select the desired ambient temperature below which ProductShield Winter will operate (forced Continuous Run operation.)

Table 5–2. Microprocessor Configurations - Continued

Configuration	Selections	Description
RANGE 1 LOCK OR RANGE 2 LOCK	**OFF** START-STOP CONTINUOUS	OFF = If both Range Locks are OFF, the unit will operate normally. If either Range 1 or Range 2 is not OFF, the unit will operate as selected whenever the set point is within that range START-STOP = The unit will always operate in Start-Stop whenever the setpoint is between the minimum & maximum temperatures for that range (see the following sub-configurations). CONTINUOUS = The unit will always operate in Continuous Run whenever the setpoint is between the minimum & maximum temperatures for that range (see the following sub-configurations).
• RANGE 1 (or 2) MINIMUM TEMPERATURE	-22°F TO **89.6**°F (-30°C to **32**°C) in 0.1°F or °C increments	Select the lowest temperature desired for this Range.
• RANGE 1 (or 2) MAXIMUM TEMPERATURE	-22°F TO **89.6**°F (-30°C to **32**°C) in 0.1°F or °C increments	Select the highest temperature desired for this range.
MIN SET POINT	**-22°F** TO 89.6°F (**-30°C** to 32°C) in 0.1°F or °C increments	Indicates to the microprocessor the desired minimum allowable set point .
MAX SET POINT	-22°F TO **89.6°F** (-30°C to **32°C**) in 0.1°F or °C increments	Indicates to the microprocessor the desired maximum allowable set point.
NO A/C POWER	**ALARM & SHUTDOWN** SWITCH TO ENGINE	ALARM & SHUTDOWN = If standby power is lost unit is to shutdown SWITCH TO ENGINE = If standby power is lost engine will be started.
S/S PARAMETERS	**TOGETHER** SEPARATE	TOGETHER = When the Minimum Run Time, Minimum Off Time, Restart Temperature, Maximum Off Time, and Override Temperatures are set in the Functional Parameter List, the same values will be used for both Frozen and Perishable setpoints. SEPARATE = When the Minimum Run Time, Minimum Off Time, Restart Temperature, Maximum Off Time, and Override Temperatures are set in the Functional Parameter List, different values may be entered for Perishable and Frozen setpoints.
REMOTE TEMP SENSOR 1 (or 2 or 3)	ON / **OFF**	ON = A remote sensor has been added to the unit, and connected into the wire harness. OFF = There is no Remote Sensor (1or 2 or 3) in this unit.

Table 5–2. Microprocessor Configurations - Continued

Configuration	Selections	Description
DOOR SWITCH	**SWITCH NOT INSTALLED** DOOR OPEN SWITCH OPEN DOOR OPEN SWITCH CLOSED	SWITCH NOT INSTALLED = There is no door switch. DOOR OPEN SWITCH OPEN = A Door switch has been installed. The switch contacts will be OPEN whenever the door is OPEN. DOOR OPEN SWITCH CLOSED = A Door switch has been installed. The switch contacts will be CLOSED whenever the door is OPEN.
• DOOR SWITCH	**ALARM ONLY** UNIT SHUTDOWN LOW ENGINE SPEED DATA RECORDER ONLY	ALARM ONLY = When Door switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter. UNIT SHUTDOWN = When Door switch indicates that the door is open, a warning alarm will be displayed in the MessageCenter, and the unit will shutdown. If this setting is chosen the following “unit shutdown below” setting will also be available. LOW ENGINE SPEED = When Door switch indicates that the door is open, the engine will be forced to low speed. If this setting is chosen the following “run low speed below” setting will also be available. NOTE The DataLink data recorder will record every time the door is opened or closed when using any of the preceding alarm/shutdown/speed change settings. DATA RECORDER ONLY = The DataLink data recorder will record every time the door is opened or closed. There will be no alarms or messages displayed in the MessageCenter.
•• UNIT SHUTDOWN BELOW (temperature)	**OFF** 120 to -20°F (49 to -29°C)	If Door switch= Unit Shutdown is selected: OFF = the unit will shutdown at any ambient temperature. Value = when ambient temperature is below the entered value, shutdown will be allowed. (When ambient temperature is above the entered value, the unit will not shutdown.)
•• RUN LOW SPEED BELOW (temperature)	**OFF** 120 to -20°F (49 to -29°C)	If Door switch= Low Engine Speed is selected: OFF = the unit will transition to low speed at any ambient temperature. Value = when ambient temperature is below the entered value, the engine will be forced to low speed will be allowed. (When ambient temperature is above the entered value, the engine will not be forced to low speed.)

Table 5–2. Microprocessor Configurations - Continued

Configuration	Selections	Description
REMS1 (Remote Switch 1) OR REMS2 (Remote Switch 2) NOTE If the configuration is set for a switch, not for a panel, the following sub configuration will also be available.	**NOT INSTALLED** DOOR OPEN SWITCH OPEN DOOR OPEN SWITCH CLOSED SWITCH ON CONTACTS OPEN SWITCH ON CONTACTS CLOSED REMOTE PANEL	Switch not installed = There is no remote switch or panel. DOOR OPEN SWITCH OPEN = The remote switch will be used as a door switch. The switch contacts will be OPEN whenever the door is OPEN. DOOR OPEN SWITCH CLOSED = The remote switch will be used as a door switch. The switch contacts will be CLOSED whenever the door is OPEN. SWITCH ON CONTACTS OPEN = The remote switch will be used as a remote control switch. The switch contacts will be OPEN whenever the switch is in the ON position. SWITCH ON CONTACTS CLOSED = The remote switch will be used as a remote control switch. The switch contacts will be CLOSED whenever the switch is ON. REMOTE PANEL = If set to this value, the remote panel SYSTEM ON/OFF key will be enabled. The switch panel mounted Main Power Switch must be toggled out of the OFF position and the remote panel SYSTEM ON/OFF key must be pressed for the unit to operate. However, if the Override Remote Switch 1 or 2 Functional Parameter is set to YES, the remote panel is disabled.
• REMS1 OR • REMS2	**ALARM ONLY** UNIT SHUTDOWN LOW ENGINE SPEED DATA RECORDER ONLY	ALARM ONLY = When the switch is activated, a warning alarm will be displayed in the MessageCenter. UNIT SHUTDOWN = When the switch is activated, a warning alarm will be displayed in the MessageCenter, and the unit will shutdown. LOW ENGINE SPEED = When the switch is activated, the engine will be forced to low speed. DATA RECORDER ONLY = The DataLink data recorder will record every time the the switch is activated. There will be no alarms or messages displayed in the MessageCenter.
SET TIME	Indicates to the microprocessor the time and date for the DataLink data recorder Real Time Clock .	
• MONTH	1-12	Select the correct month of the year.
• DAY	1-31	Select the correct day of the month.
• YEAR	1998 - 2037	Select the correct year.
• HOURS	0-23	Select the correct hour (0-11 is AM / 12-23 is PM)
• MINUTES	0-59	Select the correct minute.

Table 5–2. Microprocessor Configurations - Continued

Configuration	Selections	Description
NATURAL DEFROST	YES / **NO**	YES = Natural defrost will be allowed NO = Natural defrost will not be allowed Refer to Section 4.6 for more information on natural defrost)
DECIMAL	**NOT DISPLAYED**	NOT DISPLAYED = set point will not be shown with a decimal. All other temperatures will still be displayed with a decimal.
	DISPLAYED	DISPLAYED = set point will be shown with a decimal and temperatures may be selected to a tenth of a degree.
8 HOURS ADDITIONAL DATA:	**YES** / NO	YES = When the Main Power switch is placed in the OFF position, the DataLink data recorder will continue to record data for an additional 8 hours. NO = When the Main Power switch is placed in the OFF position, the DataLink data recorder will stop recording data.
HIGH SPEED DELAY	**1 Minute** 0 to 10 minutes in 0.5 minute increments	Select the length of time unit remains in low speed before transitioning to high speed.
SATELLITE COMM (This Configuration is an option, it will not display if the option is not installed.)	**OTHER** QUALCOMM	OTHER = The microprocessor is set for communication from Qualcomm T2 (Trailer Tracs 2) or any other supplier. QUALCOMM =- The microprocessor is set for communication from Qualcomm Trailer Tracs.
UNIT OPERATION:	**STANDARD** RAIL	STANDARD = The microprocessor is set to control over-the-road trailer refrigeration operation. RAIL = The microprocessor is set to control Rail refrigeration operation. When this Configuration is set to “RAIL” the following “VEHICLE ID”, “RAIL SHUTDOWN OVERRIDE” and “RAIL OVERRIDE RESTARTS” Sub-Configurations will be available.
• VEHICLE ID:	ASSET **TRAILER** CAR	This Configuration modifies the prefix wording used for display of the customer assigned ID number entered in the “TRAILER ID” Configuration. For example, if the customer assigned ID number entered is 12345…. ASSET = will display “ASSET # 12345” TRAILER = will display “TRAILER # 12345” CAR = will display “CAR # 12345”
• RAIL SHUTDOWN OVERRIDE:	NO **YES**	NO = When the A30 - “FAILED TO RUN MIN TIME” or A31 - “FAILED TO START - AUTO” alarm is activated, the microprocessor will not override the alarm(s) and the unit will not restart until the alarms are cleared manually. YES = When either an A30 - “FAILED TO RUN MIN TIME” or A31 - “FAILED TO START - AUTO alarm is activated, the unit will automatically override and clear the alarm(s) and attempt a restart after 4 hours. When this Configuration is set to “YES” the following “RAIL OVERRIDE RESTARTS” Sub-Configurations will be available.

Table 5–2. Microprocessor Configurations - Continued

Configuration	Selections	Description
• RAIL OVERRIDE RESTARTS:	1-20 **3**	With the default setting the microprocessor is allowed to override and clear the A30 - “FAILED TO RUN MIN TIME” or A31 - “FAILED TO START - AUTO alarm(s) three consecutive times before the override is locked out and no further restart attempts will be allowed until the alarm(s) are cleared manually. The number of restart attempts allowed before the override is locked out may be changed by entering the desired number in this Sub-Configuration. Setting this number too high may result in a discharged or damaged battery if the unit never actually starts or fails to run long enough to charge the battery prior to shutting down again.
ENABLE INTELLISET AT = KEY	**NO** YES	YES = Allows access to the IntelliSet menu using the = key.
		NO = Allows access to the IntelliSet menu using the SELECT key.
SUPPLY AIR LIMIT FOR S/S	-21.6° to 0° F (-12° to 0°C) in 0.5°F or °C increments. **DEFAULT: -21.6°F (-12°C)**	Value to be used to calculate the lowest allowable supply air temperature, when in Start-Stop Operation, in accordance with the formula “Set Point + this value = coldest allowable supply air temperature“. For example: Fahrenheit: if the set point is 35°F and the Configuration value is set at -10°F the calculation is 35 + (-10) = 25°F lowest allowed supply air temperature. Celsius: if the set point is 2°C and the Configuration value is set at -6°C the calculation is 2 + (-6) = -4°C lowest allowed supply air temperature.
SUPPLY AIR LIMIT FOR CONT	-21.6° to 0° F (-12° to 0°C) (in 0.5°F or °C increments) **DEFAULT: -5.0°F (-2.7°C)**	Value to be used to calculate the lowest allowable supply air temperature, when in Continuous Operation, in accordance with the formula “Set Point + this value = coldest allowable supply air temperature“. For example: Fahrenheit: if the set point is 35°F and the Configuration value is set at -10°F the calculation is 35 + (-10) = 25°F lowest allowed supply air temperature. Celsius: if the set point is 2°C and the Configuration value is set at -6°C the calculation is 2 + (-6) = -4°C lowest allowed supply air temperature.
HIGH SPEED PULLDOWN	ON / **OFF**	When active, this logic indicates if temperature limits regulating the exit of pulldown mode are modified or not. ON = Unit will continue in High Speed until it reaches set point.
		OFF = Normal unit operation.
CONFIG COMPLETE	Press the “=” key to exit configurations	

SECTION 6 – MESSAGECENTER

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SECTION 6

MESSAGECENTER

6.1 MESSAGECENTER MESSAGES

The following table lists all of the messages which do not appear in other lists in this manual and a description of their meaning. Refer to Section 7 for a list of alarm messages. Refer to Section 3.13 for a list of Unit Data messages. Refer to Section 3.15 for a list of Functional Parameter messages. Refer to Section 5.2.1 for a list of Configuration messages.

MessageCenter MESSAGES	
Message	**Description**
↑↓ TO SCROLL, THEN = TO LOCK	This message is used when viewing Unit Data. Use the UP and DOWN arrow keys to move through the Data list. Press the = key to lock a Data item in the MessageCenter.
↑↓ TO SCROLL, THEN = TO SAVE	Press the UP or DOWN arrow key to scroll through menu selections available in this mode. When you reach the desired selection, press the = key to store new value in microprocessor's memory.
↑↓ TO SCROLL, THEN = TO SELECT	Press the UP or DOWN arrow key to scroll through menu selections available in this mode. When you reach the desired selection, press the = key to select it.
= TO INSTALL, INSTALLS LEFT XX	An Option PC Card has been inserted into the PC Card slot. Press the = key to install the option into the microprocessor. The number of installs remaining on the PC Card will be shown.
ACTIVE	This message will appear in the MessageCenter along with the current IntelliSet indicating that the IntelliSet is active and none of its settings have been modified.
ACTIVE ALARM LIST CLEARED	The list of active alarms in the microprocessor has been erased. (This does *not* remove alarms from the DataLink data recorder.)
ALL ALARMS CLEARED	The list of active and inactive alarms in the microprocessor alarm lists have been erased. (This does *not* remove alarms from the DataLink data recorder.)
ALL INFO LOADED - REMOVE CARD	All data has been loaded into the microprocessor from the PC Card. The card may be safely removed from the microprocessor.
BACK TO CONFIGS	Pressing the = key with this message showing will return the user to the main microprocessor Configuration list.
BACK TO FUNC PARAMS	Pressing the = key with this message showing will return the user to the main Functional Parameter list.
BAD PC CARD OR CARD SLOT	The microprocessor has detected a problem with either the PC card or the PC card slot.
BUZZER OFF IN X MINS	The Buzzer circuit has been energized in Component Test Mode. The Buzzer circuit will continue to be energized for the number of minutes shown.
CALIBRATION UNSUCCESSFUL	An attempt to calibrate the discharge transducer failed.
CANNOT ENTER TRIP START	Cannot enter Trip Start. A problem has been detected within the DataLink data recorder.
CANNOT START DEFROST CYCLE	Due to current unit conditions, the defrost cycle cannot be started. Refer to Defrost Sections 3.9 and 8.8.9.
CANNOT START PRETRIP	Due to current unit conditions a Pretrip test cannot be started. Refer to Pretrip Section 3.4.
CANNOT DOWNLOAD - BATTERY TOO LOW	Data cannot be downloaded and software upgrades are prohibited when battery voltage is below 7.0 volts. This message will be displayed until the serial cable is removed.
CARD FULL, REMOVE CARD	The PC Download Card is full. There is no additional room to download information from the microprocessor. You may safely remove the PC Card from the slot.

MessageCenter MESSAGES - Continued	
Message	**Description**
CARD LOCKED - REMOVE CARD	The lock switch on the PC Card is in the “Locked” position. To use the PC Card, move the switch to the “Unlocked” position.
CARD REMOVED, DATA NOT COPIED	The PC Card was removed before all data was copied onto the card.
CARD REMOVED, REINSERT CARD	The PC Card was removed from the card slot before the operation was completed. Reinsert the PC Card into the card slot to perform the operation.
CFG: =TO LOAD,↑ TO CANCEL	A Configuration Card has been inserted into the PC Card slot. Press the = key to load configurations into microprocessor.
CHANGE INTELLISET TO EXIT	The IntelliSleep IntelliSet is active. Alternates with “IN-TELLI-SLEEP MODE” at 5 second interval whether unit is running or not.
CHARGE MODE-HOLD=TO EXIT	Service Mode has the refrigeration system set so that it can be charged with refrigerant through the liquid line service valve. Press the = key to manually exit, or wait until the charging is complete.
CHECK AT NEXT SERVICE INTERVAL	The unit needs to be checked at next service interval. There is currently an active non-shutdown alarm in the alarm list.
CHECK DOOR	Door switch indicates that a refrigerated compartment door is not closed.
CHECK FUEL LEVEL (Requires Optional Sensor)	The level in the fuel tank is very close to empty.
CHK WIRES FROM MICRO TO KEYPAD	There is a communication signal lost between the keypad, display and control module. Check and test the wiring to the keypad/display
COMPONENT TEST MODE	Pressing the = key while this message is being displayed will allow user access to Component Test Mode.
CONFIG ERROR, REMOVE CARD	There was an error configuring the microprocessor with the Configuration PC Card. Remove the PC Card from the slot.
CONFIGS COMPLETE,= TO EXIT	The user has reached the end of the Configurations List. Pressing the UP or DOWN ARROW key will start list over. Press the = key to exit Configuration List.
CONFIGURATION MODE	Press the = key to enter Configuration Mode.
CONFIGURATION NOT CHANGED	New configuration selection was not entered (saved) within the 5 second time limit.
CONTINUOUS LOCKED	The current set point is within a range that has been locked into the Continuous Run Mode. Start-Stop can not be selected.
CONTINUOUS RUN MODE SELECTED	The unit operating mode has been changed from Start-Stop to Continuous Run.
COPY COMPLETE, REMOVE CARD XX	A DownLoad PC Card has been inserted into the PC Card slot, and all data from the DataLink data recorder has been copied onto the PC Card. You may safely remove PC Card from the slot. XX = number of empty download slots remaining on the card.
COPY ERROR, REMOVE CARD XX	A DownLoad PC Card has been inserted into the PC Card slot and an error occurred while the data was being copied onto the PC Card. You may safely remove the PC Card from the slot. XX indicates the number of empty download slots remaining on the card.
COPYING DATA-PLEASE WAIT	A DownLoad PC Card has been inserted into the PC Card slot and all data from the DataLink data recorder is being copied onto the PC Card. DO NOT REMOVE THE CARD WHILE THIS MESSAGE IS BEING DISPLAYED.
DATA RECORDER FAILURE	The microprocessor has stopped recording Unit Data.
DEFROST CYCLE STARTED	The unit has gone into defrost.
DOOR OPEN	A refrigerated compartment door is open.

MessageCenter MESSAGES - Continued	
Message	**Description**
DOOR OPEN - LOW SPEED	A refrigerated compartment door is open forcing the unit to run in low speed.
ENTERING SERVICE MODE	The initial message for Service Mode.
ERROR: ENG HRS > SWITCH ON HOURS	When setting up a replacement microprocessor, incorrect hours have been entered
ERROR: HI SP HRS > TOTAL ENG HOURS	
ERROR: SBY HRS > SWITCH ON SBY HRS	
EVAC / CHARGE MODE	The unit is in Service Mode, and the refrigeration system is ready to be evacuated then charged with refrigerant. Refer to Section 5.2.3.
EXITING PRETRIP MODE	Pretrip has been aborted either by user or by a pretrip alarm.
EXITING SERVICE MODE	Service Mode has been turned off and unit is returning to normal operation.
FORCED LOW ENGINE SPEED	Due to current ambient conditions and power requirements, the engine is being set to operate in Low Speed. (See Section 4.8.3, step 1 for more information.)
FUNCTION NOT CHANGED	The = key was not pressed in the allotted amount of time to select the new Functional Parameter setting. The new setting was not stored and the old setting will be used.
HOUR METERS NOT CHANGED	Indicates that no changes have been made to the hour meters in either the configuration or functional parameter lists.
INACTIVE ALARMS IN MEMORY	There are inactive alarms in the microprocessor alarm list which have not yet been cleared.
INSTALLED, REMOVE CARD XX	An Option PC Card has been inserted into the PC Card slot, and the option has been installed in the microprocessor. The PC Card may safely be removed from the slot. XX indicates the number of option installations remaining on card.
INSTALLING OPTION, PLEASE WAIT	An Option PC Card has been inserted into the PC Card slot, and the option is being installed in the microprocessor. DO NOT REMOVE THE CARD WHILE THIS MESSAGE IS BEING DISPLAYED.
INSTALL STOPPED, REINSERT CARD	An Option PC Card has been inserted into the PC Card slot, and the install process has been stopped by the PC Card not being fully inserted in the slot, or by being removed. Remove and reinsert PC Card to continue.
INTELLI-SLEEP MODE	The IntelliSleep IntelliSet is active. This message alternates with “CHANGE INTELLISET TO EXIT” at 5 second interval whether unit is running or not
KEYPAD LOCKED-BATTERY TOO LOW	Once the battery voltage goes below 7.0 Volts for 10 seconds, all of the keys on the keypad will be locked.
LIST END, = TO CLEAR ALARMS	The end of the Alarm list has been reached. Pressing the = key will clear the Alarm list.
LOADING INFO	A Configuration PC Card has been inserted into the PC Card slot, and information from the card is being loaded into the microprocessor. DO NOT REMOVE THE CARD WHILE THIS MESSAGE IS BEING DISPLAYED.
MAIN MENU	Consists of Configuration Mode, Component Test and Service Modes.
MAX SETPOINT HAS BEEN REACHED	Maximum set point allowed by configuration settings has been reached.
MICRO WILL RESET & RESTART NOW	The microprocessor Program software has just been changed, or a new configuration has been programmed into the microprocessor. The microprocessor will turn itself off then on again (similar to a computer reboot) in order for the changes to be effective.

MessageCenter MESSAGES - Continued	
Message	**Description**
MICRO WILL STOP IN XXX SECONDS	The Main Power switch has been placed in the OFF position and the system valves are closing. The display will turn off when the count down reaches zero.
MIN SETPOINT HAS BEEN REACHED	Minimum Set Point allowed by configuration settings has been reached.
MODIFIED	This message will appear in the MessageCenter along with the current IntelliSet indicating that the IntelliSet is active and one or more of its settings have been modified.
NEW SW: = TO LOAD, TO ↑ CANCEL	A Program PC Card has been inserted into the PC Card slot, and the program on the PC Card is a newer version than what is already loaded in the microprocessor. Press the = key to load the program.
NO ACTION TAKEN, REMOVE CARD	A Program PC Card has been inserted into the PC Card slot, and no key presses have been made to install the program into the microprocessor. The PC Card may be safely removed from the slot.
NO ACTIVE ALARMS	There are no active alarms in the microprocessor Alarm List.
NO DATA ON CARD, REMOVE CARD	A Program or Configuration PC Card has been inserted into the PC Card slot, and no valid data is present on the PC Card. The PC Card may safely be removed from the unit.
NO DATA TO COPY, REMOVE CARD	A Download PC Card has been inserted into the PC Card slot, and there is no valid data in the DataLink data recorder to copy onto the PC Card. The PC Card may safely be removed from the unit.
NO INACTIVE ALARMS	There are no inactive alarms in the Alarm List
NO INSTALLS LEFT, REMOVE CARD	An Option PC Card has been inserted into the PC Card slot, and all install options have been used. The PC Card may safely be removed from the unit.
OLD INTELLISETS-USE REEFERMAN	The IntelliSets that are on the Configuration PC Card were written with too old of a PC Program, like ServiceManager. The software in the micro requires IntelliSets to be written to the Configuration PC Card using ReeferManager. Rewrite the information to the card using ReeferManager, then use it in the microprocessor again
OLD SW:CANNOT LOAD-REMOVE CARD	A Program PC Card has been inserted into the PC Card slot, and the major version of the program on the PC Card is an older version than what is already loaded in the microprocessor. Software with older major versions can not be loaded into the microprocessor. Remove the PC Card.
OLD SW, = TO LOAD, ↑ TO CANCEL	A Program PC Card has been inserted into the PC Card slot, and the minor version of the program on the PC Card is an older version than what is already loaded in the microprocessor. Press the = key to load the older program.
PC MODE	The Main Power switch is in the OFF position, the PC Mode Jumper is connected and engine is not running in order to enter PC Mode.
PM DUE	Preventative Maintenance is now due on the unit.
PRESS ↑↓ TO VIEW DATA	Press the UP or DOWN ARROW key to scroll through the Data List.
PRESS ↑↓ TO VIEW SETTINGS	Press the UP or DOWN arrow key to scroll through Functional Parameter Settings.
PRESS ↑↓ TO VIEW PRINT MENU	Press the UP or DOWN arrow key to view the Strip Print setup menu.
PRESS = TO MARK TRIP START	Press the = key to mark the start of the trip in the DataLink data recorder.
PRESS = TO START PRETRIP	Press the = key to begin Pretrip tests.
PRESS ↑↓ TO VIEW INTELLISET	Press the UP or DOWN arrow key to view IntelliSet list. This message will appear after IntelliSets are installed into the microprocessor, and the unit can not be started until an IntelliSet is selected.

MessageCenter MESSAGES - Continued	
Message	**Description**
PRETRIP FAIL & COMPLETED	The Pretrip test is completed, and some of the Pretrip tests did not pass. Check the Alarm List for Pretrip alarms.
PRETRIP FAIL IN TEST XX	Some of the Pretrip tests did not pass and the Pretrip was not completed. Check the Alarm List for Pretrip alarms.
PRETRIP PASS	All of the Pretrip tests were ok.
PRETRIP STOPPED BY USER	Pretrip has been stopped by user.
PRODUCTSHIELD: ECONO ON	The unit is operating in ProductShield Econo which overrides normal unit Start-Stop or Continuous Run operation. Refer to Section 4.7.3.
PRODUCTSHIELD: HIGH AIR ON	The unit is operating in ProductShield High Air which overrides normal unit speed operation. Refer to Section 4.7.3.
PRODUCTSHIELD: WINTER ON	The unit is operating in ProductShield Winter which overrides normal unit operation. Refer to Section 4.7.3.
READY TO INSTALL SOFTWARE	The microprocessor has been forced into Program Install Mode. If this message does not clear after loading the current version of software, check for a shorted circuit between 5MP5 and 5MP6.
RECOVER / LEAK CHK / EVAC MODE	This message will be displayed when the unit is in Service Mode and the system is ready for recovery and leak testing.
REMOVE CARD - BATTERY TOO LOW	If a PC card is inserted when battery is below 7.0 volts this message will be displayed until card is removed.
REMOTE SWITCH 1 (2) OPEN	Remote switch is open. May be connected to a refrigerated compartment door or a remote control switch.
REMOTE SWITCH 1 (2) OPEN - LOW SPEED	Shows that the remote switch is open and that the unit is running in low speed. Switch may be connected to a refrigerated compartment door or a remote control switch.
REMOVE JUMPER	The Configuration/Technician Test Mode has been entered. Remove the jumper wire before continuing.
SAME SW, = TO LOAD, ↑ TO CANCEL	A Program PC Card has been inserted into the PC Card slot and the program on the PC Card is the same as the program currently in the microprocessor. Press the = key to reload the same program or press the UP ARROW key to cancel and remove card.
SERVICE MODE	Selection in Configuration and Technician Test Modes which is used when servicing the refrigeration system. Refer to Section 5.2.3.
SETPOINT CHANGED	The new set point has been entered (saved into microprocessor memory), the new set point will be used.
SETPOINT NOT CHANGED	The new set point has NOT been entered (NOT saved into microprocessor memory), the old set point will be used.
SETTING SMV: XXX %	The Main Power Switch has been toggled out of the OFF position and the CSMV is opening.
SLEEP MODE, OFF / ON TO WAKE	The unit is cycled off in Sleep Mode. Place the Main Power switch in the OFF position, then back to the desired position to wake the microprocessor up.
SLEEP WARNING: DOOR OPEN	The unit is configured for Rail Mode and the unit is in Sleep Mode and a refrigerated compartment door is open. The unit will start as needed for Sleep Mode.
SLEEP WARNING: NO TEMP CONTROL	The unit is running in Sleep Mode to charge the battery and (in Engine Operation) warm the engine coolant. It is not running to provide temperature control.
SLEEP WARNING: REMS1(2) OPEN	The unit is configured for Rail Mode and the unit is in Sleep Mode and a remote switch is open. The switch may be connected to a refrigerated compartment door or to a remote control switch. The unit will start as needed for Sleep Mode.
SMV CLOSING: WAIT XXX SECONDS	Power Up and the CSMV is closing. XX indicates the number of seconds remaining until valve is fully closed.

MessageCenter MESSAGES - Continued	
Message	**Description**
START STOP LOCKED	The set point has been locked into Start-Stop Operation. Continuous Run can not be selected.
START-STOP MODE SELECTED	Start-Stop Operation has been selected.
STATUS OK	The unit is operating correctly.
TECHNICIAN RESET REQUIRED (A21)	AL11 (Low Engine Oil Pressure) or AL12 (High Coolant Temperature) has been activated three times in the last two hours and the unit has been locked out. The unit must be brought to a Carrier Transicold Dealer for service.
TEST #1(to #15) XX% COMPLETE	Pretrip is currently running this test and is XX% complete.
TIME SELECTION NOT CHANGED	A time change was started but not entered (saved) in Configuration List.
TRIP START ENTERED	The Trip Start marker has been placed in the DataLink data recorder.
UNIT BATTERY TOO LOW	The unit battery has dropped below 7 volts for more than 10 seconds.
UNIT SHUTDOWN - DOOR OPEN	The unit has shutdown because the refrigerated compartment door is open.
UNIT SHUTDOWN - SEE ALARM LIST	An active shutdown alarm has shut the unit down.
UNIT SHUTDOWN - RMS1(2)	The unit has shutdown because switch is open. May be connected to a door or a remote control switch.
UNKNOWN CARD - REMOVE CARD	A defective or different type of PC Card has been inserted into the PC Card slot. The microprocessor can not recognize any data on the card. The card may be safely removed from the microprocessor.
WARNING: DIESEL RESTART ON	When electric power is not available while the unit is operating in Standby Operation, the unit will switch to Engine Operation.
WARNING: NO TEMP CONTROL	The temperature sensors have failed and the unit has entered Cargo Protect Mode. Refer to Section 4.8.1.
WRONG UNIT TYPE, REMOVE CARD	A configuration PC card has been inserted into the PC Card slot. The unit model family type on the PC card is not in the same unit family type as the microprocessor. The card may be safely removed from the microprocessor.

SECTION 7 – ALARM TROUBLESHOOTING

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SECTION 7

ALARM TROUBLESHOOTING

⚠ WARNING

Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.

⚠ WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the Main Power Switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.

7.1 INTRODUCTION

This section provides guidance for troubleshooting alarms. The alarm light will be illuminated when there is one (or more) alarm(s) stored in the microprocessor. Instructions for reviewing the alarm lists are provided in sections 3.11 & 3.12.

When an alarm occurs, look through both Active and Inactive alarm lists in the microprocessor and make note of all alarms. Each alarm begins with an A (active) or I (inactive) followed by an alarm number and description. Alarms are listed in this guide by alarm number in ascending order.

Before beginning to actually troubleshoot an alarm, visually inspect the unit, in particular the area of the unit that is causing a problem. In many cases the cause of the problem will be obvious once a visual inspection is performed. For those cases where the cause of the problem is not obvious, this troubleshooting guide will be of assistance.

Troubleshooting should begin with the first alarm that appears in the active alarm list. The first alarm that appears is the last alarm that was recorded. Other alarms in the list may have contributed to the occurrence of the first alarm.

The check items in the troubleshooting guide are listed in order of their likeliness of occurrence and ease of testing. We recommend that you follow the order in which they are presented; however, there may be times when situations or experience lead a to the use of a different order. For example, if the trailer is loaded, condensing unit checks should be done first, even though some evaporator section checks may be listed before them.

When the cause of the problem is corrected, it is not necessary to continue through the remainder of the steps. Some active alarms will inactivate themselves automatically once the cause has been corrected. Alarms that do not inactivate themselves automatically must be cleared manually. (See Note 1 page 7–2.)

When repairs are completed, run the unit through a Pretrip cycle and verify that no further active alarms occur. Also, the inactive alarm list should be cleared so that there are no 'old' alarms in memory when the unit leaves the repair facility.

If the message **CHECK WIRES FROM MICRO TO KEYPAD** appears in the MessageCenter, there is a communication error between the keypad and the microprocessor. With no communication, there will not be an associated alarm. Should this occur, check the wire connections behind the keypad assembly, at the keypad itself (remove the rear cover to check), and at connector 6MP on the microprocessor. Check for microprocessor status led blinking at 1 second rate (1 second ON/1 second OFF).

When working on the refrigeration system, an accurately calibrated manifold gauge set should always be installed. It is not necessary to connect an additional high pressure gauge at the liquid line service valve. The compressor suction pressure, compressor discharge pressure and evaporator outlet pressure can be read in the unit data list.

In high or low ambients it may be necessary to cool or warm the refrigerated compartment temperature before performing specific tests providing that the compartment is not loaded with perishable product.

7.2 NOTES

Note 1 The active alarm list may be cleared by scrolling to the end of the list. “LIST END, = TO CLEAR ALARMS” will appear in the MessageCenter. Pressing = will inactivate the alarms. That is: the alarm is “cleared” from the active alarm list and moved to the inactive alarm list for later review **if** the condition that caused the alarm has been corrected. When Shutdown Alarms are cleared, the unit will attempt to restart. When non-Shutdown Alarms are cleared, there will be no noticeable change in the unit’s operation.

The Inactive Alarm list is cleared in the same way. When the inactive alarm list is cleared both the inactive and active lists are cleared. Clearing the inactive alarm list removes the alarm from the microprocessor.

Note 2 Many electrical circuits may be tested by powering the microprocessor without starting the unit. Two methods are available to do this.

METHOD ONE:
Place the microprocessor in PC Mode. Refer to Section 5.3.

METHOD TWO:
Set the NO A/C POWER Configuration to ALARM & SHUTDOWN and ensure the unit is disconnected from standby power. Start the unit in standby:

For units equipped with a Main Power switch switch labeled ENGINE/OFF/STANDBY (DOES), place the DOES in the STANDBY position.

For units equipped with a Main Power switch labeled START/RUN-OFF (SROS), place the switch labeled STANDBY/ENGINE (DES) in the STANDBY position and then place the SROS in the START/RUN position.

Note 3 Sensors may be tested at the component plug. The sensor and interconnecting wiring may also be tested at the 1MP plug. Remove plug and, using an ohmmeter, measure resistance. Be careful not to damage the connector pins. (Refer to Section 8.9.10 for chart of resistances for different sensors.)

Note 4 The switches, (Remote 1 & 2, Door, High Pressure, Engine Oil Pressure, Defrost Air and Evaporator High Temperature 1, 2 or 3) may be tested at the component plug. The switch and interconnecting wiring may also be tested at the 1MP, 2MP, OC or EVC plug. Remove plug and, referring to the wiring schematic, check for voltage from the microprocessor through the switch to ground or from the voltage source through the switch to the microprocessor as applicable.

Note 5 Some tests can only be conducted while the unit is operating. The unit may be started automatically in either Engine Operation or Standby Operation.

For units equipped with a Main Power switch labeled ENGINE/OFF/STANDBY (DOES), place the DOES in the ENGINE or STANDBY position as desired.

For units equipped with a Main Power switch labeled START/RUN-OFF (SROS), place the switch labeled STANDBY/ENGINE (DES) in the ENGINE or STANDBY position as desired and then place the SROS in the START/RUN position.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.3 DRIVER / OPERATOR ALARMS			
1 LOW FUEL LEVEL WARNING			
Note: This is an optional alarm which will not occur unless a fuel level sensor is present and configured ON. • TRIGGER ON: Fuel level is 15% or less for more than 30 seconds. • UNIT CONTROL: Engine Operation: Alarm only. Standby Operation: this alarm will not activate in standby Operation. • RESET CONDITION: Auto reset when the fuel level is above 17% for more than 30 seconds, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Low Fuel Level**	
		Check fuel level in the fuel tank.	Add fuel as needed to the fuel tank.
	2	**Check Fuel Level Sensor. Refer to procedure for Alarm 126**	
2 LOW ENGINE OIL LEVEL WARNING			
Note: This is an optional alarm which will not occur unless a fuel level sensor is present and configured ON. • TRIGGER–ON: Engine oil level is sensed approx. 7 or more qts. (6.62 or more liters) low for longer than 30 seconds. • UNIT CONTROL: Alarm Only, or may be configured to shut unit down. • RESET CONDITION: Auto reset if engine oil level is above 4 qt. (3.79 liters) low for more than 30 seconds or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check engine oil level**	
		a. Check engine oil dipstick	Add engine oil as needed to fill.
	2	**Check engine oil level switch**	
		a. Inspect engine oil level switch & connector pins & terminals	No physical damage to switch. No damaged or corroded pins in plug.
		b. Check engine oil level switch operation	Contacts open when level is more than 7 qts low Contacts closed when level is less than 4 qts low
	3	**Check engine oil level switch harness**	
		a. Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damaged or corroded pins
		b. Check for shorted circuit in harness, and continuity through the harness	Ensure the Main Power stitch is not in the OFF position. Battery voltage reading (12-13 VDC) between wires in plug
	4	**Check oil level switch**	
		a. Drain oil level to approximately 2.8 to 3-4 quarts (3.8 liters) low. Remove switch.	
		b. Visually and physically inspect upper and lower float stops.	Must be securely fastened to center rod.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.4 SHUTDOWN ALARMS			
11	**LOW ENGINE OIL PRESSURE**		
	• TRIGGER–ON: Engine oil pressure is below 12 psig (0.82 bar) for longer than 5 seconds while the engine is running. • UNIT CONTROL: Engine Operation: Shutdown and alarm. Standby Operation: Will not activate in standby. • RESET CONDITION: Auto Reset or Alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the active alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Low Engine Oil Level Warning Alarm**	
		a. Check for alarm A2	Alarm conditions must be corrected and the alarm cleared to continue
		b. Check engine oil dipstick.	Add engine oil as needed.
	2	**Check Engine Oil Pressure Switch Wiring**	
		a. Inspect switch & connector pins & terminals.	No physical damage to switch. No damage or corrosion in connector.
		b. Check switch circuit Check for voltage at switch plug between pins A (+) and B (ground)	Energize circuit. (See Note 2 page 7–2.) Voltage should be approximately 12 VDC. If OK skip to step 4, if not continue with step 3.
	3	**Check Engine Oil Switch Harness**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Check for shorted circuit in harness, and continuity through the harness.	Check for voltage from 2MP17 to plug terminal A Check for ground at plug terminal B.
	4	**Check Switch**	
		Remove switch, connect to an external pressure source and test.	Contacts closes on a pressure rise at 15 psig (1.02 bar.) Contacts open on a pressure fall at 12 psig (0.82 bar.)
	5	**Check Engine Oil Pressure**	
		Connect mechanical oil gauge.	Oil pressure must be greater than 15 psig (1.02 bar.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
12	**HIGH COOLANT TEMPERATURE**		
	• TRIGGER–ON: When in Engine Operation: for ambient temperatures below 120°F (48.9°C) Engine coolant temperature is above 230°F (110°C), or Ambient temperatures above 120°F (48.9°C), engine coolant temp is over 241°F (116°C), or Engine coolant temperature is between 230 and 241°F (110 and 116°C) for more than 5 minutes. • UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm. Standby Operation: Will not activate in standby. • RESET CONDITION: Auto Reset after 15 minutes if the engine coolant temp falls below 212°F (100°C), or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Coolant Level**	
		a. Check coolant level in overflow bottle. **WARNING** **Do not remove the cap from a hot radiator or bottle; if the cap must be removed, do so very slowly in order to release the pressure without spray.**	Level must be in the normal range.
		b. Inspect connecting tube between overflow bottle and radiator.	Connections must be airtight. No leakage or holes in tube.
	2	**Check For Bad Eng Coolant Sensor Alarm**	
		Check for Alarm 129.	Alarm conditions must be corrected and the alarm cleared to continue.
	3	**Check Freeze Point Of Coolant**	
		Use Coolant Tester to check concentration of anti-freeze mixture.	Must be between 40% to 60% Ethylene Glycol to water mixture.
	4	**Check Airflow Through Radiator & Condenser Coil**	
		a. Inspect condenser & radiator.	Ninety percent or more of the coil surface must be undamaged. No “dead” air spaces. Condenser / Radiator coil must be clean.
		b. Check condenser fan rotation / operation.	Fans should operate correctly. Air should be directed in through the grill, and into the engine compartment.
	5	**Check Water Pump Belt**	
		Check engine water pump belt.	No Glazing, no cracking, no slipping.
	6	**Check Engine Coolant Temperature Sensor**	
		a. Inspect sensor & connector pins & terminals.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check sensor resistance. (See Note 3 page 7–2.)	10,000 Ohms @ 77°F (25°C.) Refer to Table 8–5 for complete table of temperatures and resistance values.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
12	**HIGH COOLANT TEMPERATURE - Continued**		
	7.	**Check Engine Coolant Temperature Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage or corrosion in connectors.
		b Check voltage at the sensor connector with the microprocessor powered up.	Voltage reading should be 2.5 ± 0.1 VDC. This verifies microprocessor output and wiring connections to sensor.
	8.	**Check Engine Cooling System**	
		a. Compare actual engine temperature to the microprocessor reading.	Temperature must be within ±20°F (±11.1°C.)
		b. Test operation of engine coolant thermostat.	Must operate correctly.
		c. Check water pump operation.	No seepage at weep hole. Bearings tight and quiet. Impeller firmly attached to shaft.
		d. Check cooling system for scale, sludge, rust, etc.	Coolant must be clean & clear. No foreign particles or substances in it. Flush & clean the coolant system as necessary.
		e. Check water pump bypass hose to thermostat housing for internal blockage.	Must be clear and open.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
13	**HIGH DISCHARGE PRESSURE (ALARM 75 WILL ALSO ACTIVATE)**		
	• TRIGGER–ON: Compressor discharge pressure switch (HP1) contacts are open. HP1 contacts open when the discharge pressure rises to 465 psig (31.6 bar.) • UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm. Standby Operation: Refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset after 15 minutes if the compressor discharge pressure falls below 350 psig (23.8 bar), or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor.	Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display. Pressures must be in the normal range for ambient & refrigerated compartment temperature conditions. If discharge pressure is in normal range, proceed to step 4. NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.
	2	**Check Airflow Through Condenser Coil**	
		a. Inspect condenser & radiator.	Ninety percent or more of the coil surface must be undamaged. Condenser coil and radiator must be clean.
		b. Check airflow (with unit running.)	Even airflow through the entire coil. No “dead” spots.
		c. Check condenser fans.	Both fans should operate correctly. Check rotation, air should be pulled in through the grill, and discharge into the engine compartment.
	3	**Check For Refrigerant Overcharge**	
		Check refrigerant charge.	Refer to Section 8.6.2.
	4	**Check HP1 Switch**	
		Inspect switch & connector pins & terminals.	No physical damage to switch. No damage, moisture, or corrosion in connector.
	5	**Check HP1 Switch Harness**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Check for shorted circuit in harness, and continuity through the harness.	Energize Circuit. (See Note 2, page 7–2.) Check for voltage from SP5, through switch and SP15 to micro-processor terminal 2MP29.
	6	**Check HP1 Switch**	
		Check switch operation.	Test switch, refer to Section 8.8.7 step b.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
14	**HIGH A/C AMPS** • TRIGGER–ON: AC Current Sensor 1 is greater than 40A or AC Current Sensor 2 is greater than 40A for 3 seconds. • UNIT CONTROL: Engine Operation: Alarm will not activate. Standby Operation: Refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset after 15 minutes if the AC current sensor reading is less than 38 amps **or** alarm may be manually reset via keypad or by turning unit off then back on.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Generator Voltage (If Used When Alarm Occurred)**	
		Check voltage at GENCON L1-L2, L1-L3, L2-L3.	Must be nominal 460 VAC
	2	**Check Power Source Voltage (If Used When Alarm Occurred)**	
		Check voltage at PSCON L1-L2, L1-L3, L2-L3.	Must be nominal 460 VAC
	3	**Check Voltage Output From Contactors**	
		a. Check voltage at GENCON T1-T2, T1-T3, T2-T3.	Must be nominal 460 VAC
		b. Check voltage at CCON with compressor operating. T1-T2, T1-T3, T2-T3.	Must be nominal 460 VAC
	4	**Verify AC Current Sensor Accuracy**	
		Power the microprocessor. Refer to Note 2, page 7–2	Unit AC Current #1 and #2 reading in Data List must be 0.0 ± 1.0 amp.
	5	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pre-trip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	6	**Check High Voltage Components Amp Draw**	
		a. Check condenser fan amp draw at CDCON on all 3 legs.	The unit must be running for these tests to be performed. Refer to Section 2.11 for correct electrical values.
		b. Check evaporator fan motor amp draw at 1EVCON, 2EVCON & 3EVCON (if applicable) on all 3 legs.	
		c. Check compressor amp draw at CCON on all 3 legs.	
		d. Check evaporator heater amp draw at 1HTCON1, 1HTCON2, 2HTCON1, 2HTCON2, 3HTCON1 AND 3HTCON2 (if applicable) on all 3 legs.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
15	**BATTERY VOLTAGE TOO HIGH** • TRIGGER–ON: Voltage at the microprocessor is greater than 17 VDC. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset after 15 minutes when the voltage at the microprocessor is between 11 and 14 VDC, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Battery Voltage**	
		a. Test voltage at battery with unit off.	Must be between 11-16 VDC.
		b. Test voltage at battery with unit running.	Must be between 12-16 VDC.
	2	**Check Battery Charger Voltage**	
		a. Test voltage at battery charger output terminal with unit off.	Must be between 11-16 VDC.
		b. Test voltage at battery charger output terminal with unit running.	Must be between 12-16 VDC.
	3	**Check Voltage At Microprocessor**	
		a. Check voltage reading at microprocessor input (QC1+ to QC2-.)	Energize circuit. (See Note 2 page 7–2.) Must be between 11-16 VDC.
		b. Check voltage reading on microprocessor display.	Must be within 0.5 VDC of reading obtained at QC-1.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
16	**BATTERY VOLTAGE TOO LOW** • TRIGGER–ON: Voltage at the microprocessor is less than 10 VDC (except when the engine starter is engaged.) • UNIT CONTROL: Unit Shutdown & Alarm. Alarm condition only if activated while starting unit. • RESET CONDITION: Auto Reset after 15 minutes when the voltage at the microprocessor is between 11 - 14 VDC, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Alarm 51**	
		Check for “Alternator Not Charging Alarm”. (**Note**: The A51 name is carried over from unit models with alternators. For the Vector Model, Alarm 51 indicates that the solid state battery charger is not performing correctly.)	Alarm conditions must be corrected and the alarm cleared to continue.
	2	**Check Battery Voltage**	
		a. Inspect battery cable ends and posts.	Must be clean and tight.
		b. Test voltage at battery with unit off.	Must be above 11 VDC.
		c. Test voltage at battery with unit running.	Must be above 11 VDC.
		d. Test specific gravity of battery.	(Check for battery specifications.)
		e. Perform load test on battery. (Follow battery manufacturer’s procedure.)	(Check for battery specifications.)
	3	**Check Voltage At Microprocessor**	
		a. Check voltage reading at microprocessor input (MPQC1+ to MPQC2-).	Must be above 11 VDC.
		b. Check voltage reading on microprocessor display.	Must be within 0.5 VDC of reading obtained at QC-1.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
17	**HIGH COMP DISCHARGE TEMP**		
	• TRIGGER–ON: Discharge sensor alarm not active AND: Ambient temp below 120°F (48.9°C) and discharge temp was between 310 and - 349°F (154.4 to - 176.7°C) for 3 minutes, or Ambient temp above 120°F (48.9°C) and discharge temp was between 340 and - 349°F (171.1 and - 176.7°C) for 3 minutes, or Discharge temp ever reaches 350°F (176.7°C.) • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset after 15 minutes with Ambient temp below 120°F (48.9°C) the discharge temp falls below 300°F (148.8°C), or Auto Reset after 15 minutes with Ambient temp above 120°F (48.9°C) the discharge temp falls below 330°F (165.4°C), or alarm may be manually reset via Keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Bad Compressor Discharge Temperature Sensor**	
		Check for Alarm 125.	Alarm conditions must be corrected and the alarm cleared to continue.
	2	**Check Refrigerant Charge**	
		Check for undercharged system.	Refer to Section 8.6.2.
	3	**Check Airflow Through Condenser Coil**	
		a. Inspect condenser & radiator.	Ninety percent or more of the coil surface must be undamaged. No “dead” air spaces. Condenser coil and radiator must be clean.
		b. Check airflow (with unit running).	Even airflow through the entire coil No “dead” spots
	4	**Check CSMV**	
		Check compressor suction modulation valve.	Refer to Section 8.8.5.
	5	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.	Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display. NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.
	6	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	7	**Check Compressor Reed Valves & Gaskets**	
		Remove compressor heads & inspect condition of all reeds & gaskets.	Must be in good condition. Install new parts and gaskets as required.
	8	**Check Expansion Valve (EVXV)**	
		Check operation of valve.	Refer to Section 8.8.6
	9	**Check System For Non-Condensables**	
		Check refrigeration system for non-condensable gas(es).	No non–condensable gas(es) may be present. (Refer to Section 8.6.2.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
18	**LOW REFRIGERANT PRESSURE** • TRIGGER–ON: The compressor is operating with the suction pressure less than -10 in Hg (-0.3 BAR), with both the Front (UL1) and the Rear (UL2) unloaders energized, and the time that is selected for the LP Shutdown Delay Configuration has expired since UL1 was energized (**Note:** The MessageCenter does not display in.Hg. This alarm triggers on when the display shows less than -4.7 psig. • UNIT CONTROL: Engine Operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby Operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: If alarm only, auto reset when either UL1 or UL2 is de-energized. If unit and system shutdown and alarm, auto reset after 15 minutes. Alarm may be manually reset via keypad or by turning the unit OFF, then ON again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Refrigerant Charge**	
		Check for undercharged system.	Refer to Section 8.6.2.
	2	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.	Suction pressure must be above 3 psig (0.2 bar.) Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display. NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.
	3	**Manually Defrost Unit**	
		Defrost unit and terminate automatically.	Typical defrost cycle time is 5-20 minutes. Visually verify that all ice is cleared from evaporator coil.
	4	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	5	**Check Unloader Operation**	
		Check Front (UL1) and Rear (UL2) Unloaders.	Refer to Alarms 85 and 86.
	6	**Check CSMV**	
		a. Check compressor suction modulation valve.	Refer to Section 8.8.5 .
		b. Check airflow (with unit running.)	Even airflow through the entire coil. No “dead” spots.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
18	**LOW REFRIGERANT PRESSURE - Continued**		
	7	**Check Evaporator Sections**	
		a. Check evaporator section, return air bulkhead, air chute & cleanliness of evap. coil.	Good Air Flow. Return air not restricted. Air chute in good condition. No damage to evaporator fan motor assemblies. Evap. coil clean. Evap. fan rotation ok.
		b. Check airflow (with unit running.)	Even airflow through the entire coil. No “dead” spots.
	8	**Visually Inspect Unit**	
		Visually inspect unit for damage to the liquid line causing a restriction or any signs of temperature drop at the filter-drier.	All tubing from the receiver to the evaporator section is in good condition There is no temperature drop at the drier or anywhere on the liquid line
	9	**Check Electronic Expansion Valve (EVXV)**	
		Check operation of EVXV.	Refer to Section 8.8.6.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
19	**LOW FUEL SHUTDOWN**		
		Note: This is an optional alarm. This alarm will not occur in Standby Operation or if the Fuel Level Sensor Configuration is NO DEVICE or if the Fuel Tank Size Configuration is OFF. • TRIGGER ON: The unit is operating in Engine Operation and the fuel level is 10% or less for more than 1 minute AND Alarm 126 - "Check Fuel Sensor Circuit" is not active. • UNIT CONTROL: Alarm only or (if configured for shutdown) engine and unit shutdown and alarm. • RESET CONDITION: Auto reset when fuel level is above 12% for more than 1 minute, or alarm may be manually reset via keypad or by turning the unit off, then back on again.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Low Fuel Level Warning Alarm**	
		Check for alarm 1.	Must be cleared.
	2	**Check For Low Fuel Level**	
		Check fuel level in tank.	Add fuel as needed to the fuel tank.
	3.	**Check Low Fuel Level Sensor**	
		a. Inspect sensor & connector pins & terminals.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check Low Fuel Level Sensor.	Refer to Section 8.9.10 for sensor check out procedure.
	4.	**Check Low Fuel Level Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b Check voltage at the Low Fuel Level Sensor connector with the microprocessor powered up.	Voltage reading should be 12 - 13 VDC between terminals FLSA and FLSB. Voltage reading should be between 0 - 5 VDC between FLSC and ground wire from unit with sensor disconnected.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
20	**MAXIMUM COMPRESSOR ALARMS**		
	• TRIGGER ON: This option must be installed and alarm must be enabled by configuring the Compressor Alarm Shutdown to YES. Alarms 13, 17, 18, 27 or 28 individually occur 3 times within the last 2 hours. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Reset from inactive alarm list only. Can not be reset by turning switch OFF and then ON again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Determine Which Alarm Caused This Alarm To Be Active.**	
		a. Check active alarm list for Alarm #'s 13, 17, 18, 27, 28,or 29.	One or more of these alarms will be present.
		b. Follow the steps for the alarm(s) found above, and correct the alarm condition.	All alarms condition must be fixed.
	2	**Reset Alarm**	
		Reset all alarms from the inactive alarm list.	All alarms must be cleared to start unit.
21	**TECHNICIAN RESET REQUIRED**		
	• TRIGGER ON: The High Engine Temp Shutdown Configuration and/or Engine Oil Pressure Shutdown Configuration is/are set to YES, and either Alarm 11 – Low Engine Oil Pressure, **or** Alarm 12 – High Coolant Temperature has become active and shut the unit down three times within the past 2 hours • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: This alarm will not activate in Standby Operation • RESET CONDITION: Reset from inactive alarm list only. Can not be reset by turning switch OFF and then ON again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Determine Which Alarm Caused This Alarm To Be Active.**	
		a. Check active alarm list for Alarm #'s 11 or 12.	One or more of these alarms will be present.
		b. Follow the steps for the alarm(s) found above, and correct the alarm condition.	All alarms condition must be corrected.
	2	**Reset Alarm**	
		Reset all alarms from the inactive alarm list.	All alarms must be cleared to start unit.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
22	**LOW SUCTION SUPERHEAT**		
	• TRIGGER ON: Compressor suction superheat (Compressor Suction Temperature [CST] minus saturated temperature for Compressor Suction Pressure [CSP] refer to Table 8–7) is less than 9°F (5°C) for more than 2 minutes. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset after 15 minutes, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures and evaporator outlet pressure with those shown on the microprocessor display.	Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display. NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.
	2	**Check Refrigerant Charge**	
		Check for undercharged system.	Refer to Section 8.6.2.
	3	**Check For Restricted Evaporator Airflow**	
		Check for restricted evaporator airflow.	Check for proper Evaporator Fan operation (Refer to Section 8.9.6.) Check for correct Evaporator Fan rotation. Check defrost air switch setting and hoses. Refer to Section 8.8.9. Check for restricted bulkhead or air chute installation.
	4	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	5	**Check Compressor Suction Temperature (CST) and Evaporator Outlet Temperature (EVOT) sensors.**	
		a. Inspect CST & connector.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check CST resistance. (See Note 3 page 7–2.)	10,000 Ohms @ 77°F (25°C) Refer to Table 8–5 for complete table of temperatures and resistance values.
		c. Check voltage at harness connection to CST.	Must be 2.5 ± 0.5 VDC. This verifies microprocessor output and wiring connections to sensor.
		d. Verify accuracy of CST using infrared or other accurate temperature testing tool.	CST reading must be within ±3°F (1.7°C) of test temperature tool reading.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
22	**LOW SUCTION SUPERHEAT - Continued**		
	5 (Cont'd)	**Check Compressor Suction Temperature (CST) and Evaporator Outlet Temperature (EVOT) sensors - Continued.**	
		e. Inspect EVOT & connector.	No damage to sensor. No damage, moisture, or corrosion in connector.
		f. Check EVOT resistance. (See Note 3 page Note 3.)	10,000 Ohms @ 77°F (25°C.) Refer to Table 8–5 for complete table of temperatures and resistance values.
		g. Check voltage at harness connection to EVOT.	Must be 2.5 ±0.5 VDC. This verifies microprocessor output and wiring connections to sensor.
		h. Verify accuracy of EVOT using infrared or other accurate temperature testing tool.	EVOT reading must be within ±3°F (1.7°C) of test temperature tool reading.
	6	**Check EVOP and CSP**	
		a. Check operation of both transducers	Refer to Section 8.8.8.
		b. Check Schrader valve fitting under each transducer	Must not be physically damaged, depressor must fully open valve to allow pressure to transducer
	7	**Check EVXV**	
		Check operation of EVXV	Refer to Section 8.8.6.
	8	**Check heat exchanger**	
		With the unit running in high speed cool, check temperature of suction line inlet and outlet at the heat exchanger.	Inlet line (toward evaporator coil) must be colder than outline (toward compressor).

Alarm NO.	Steps	Alarm/Cause	Corrective Action
23	**A/C CURRENT OVER LIMIT**		
	• TRIGGER ON: The high voltage amp draw is over the limit shown in the following table for more than 10 seconds.		

CONDITION	DRAW
Engine High / Low Speed, Standby Cool or Pretrip	30A
Engine High Speed Heat	18A
Engine Low Speed or Standby Heat	14A
Engine High Speed Defrost (With heaters energized)	16A
Engine Low Speed or Standby Heat Defrost	12A
Engine High/Low Speed or Null	8A
Engine Low Speed or Standby Null	8A
Engine or Standby Natural Defrost (when heaters are de-energized)	10A

		• UNIT CONTROL: Engine Operation: refrigeration system shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized.	
		• RESET CONDITION: Auto reset after 15 minutes or alarm may be manually reset via keypad or by turning the unit OFF, then back ON.	
		NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.	
	1	**Perform Pretrip.**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	2	**Check Configurations for Correct Maximum Amps Settings**	
		a. Check DIESEL MAX GEN AMPS configuration setting.	Setting should be 24 - 25 Amps. Maximum recommended setting is 25 Amps. Minimum recommended setting is 22 Amps.
		b. Check STANDBY MAX GEN AMPS configuration setting.	Setting should be 22 - 25 Amps. Maximum recommended setting is 25 Amps. Minimum recommended setting is 22 Amps.
		c. Check STARTUP MAX AMPS configuration setting.	Setting should be 15 - 19 Amps. Maximum recommended setting is 19 Amps.
		d. Check DIESEL OFFSET MAX AMPS configuration setting.	Setting should be 4 Amps.
	3	**Check For Electrical Failure In System**	
		a. Check electrical motors.	Visually inspect condenser fans and evaporator fan for damage to motor or fan blade, or for foreign material obstructing the movement of the fan. Listen for noise caused by failed bearing or motor obstruction.
		b. Check for defective wiring.	Check for discolored wiring at contactors and loose connections.
		c. Check for defective contactor.	Remove and replace any suspected contactor(s).
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
23	**A/C CURRENT OVER LIMIT - Continued**		
	4	**Check High Voltage Components Amp Draw**	
		a. Check condenser fan amp draw on all legs. (CDCON)	These checks must be made with the unit operating. **WARNING** **Caution and good electrical practices must be used when working around and with high voltage circuits.** Verify that all three actual amperage readings for each component are within 10% of each other, and are within the values shown in Section 2.11.
		b. Check evaporator fan motor amp draw on all 3 legs (1EVCON)	
		c. Check compressor amp draw on all 3 legs. (CCON)	
		d. Check heater amp draw. (1HTCON1, 1HTCON2, 2HTCON1, 2HTCON2, 3HTCON1 & 3HTCON2 - if applicable)	
	5	**Check Generator Voltage (If Used When Alarm Occurred)**	
		Check voltage at GENCON L1-L2, L1-L3, L2-L3.	Must be within voltage limits shown in Section 2.11.
	6	**Check Power Source Voltage (If Used When Alarm Occurred)**	
		Check voltage at PSCON L1-L2, L1-L3, L2-L3.	Must be within voltage limits shown in Section 2.11.
	7	**Check Voltage Output From Contactors**	
		a. Check voltage at GENCON T1-T2, T1-T3, T2-T3.	Must be within voltage limits shown in Section 2.11.
		b. Check voltage at CCON with compressor operating. T1-T2, T1-T3, T2-T3.	Must be within voltage limits shown in Section 2.11.
	8	**Verify AC Current Sensor Accuracy (CT2 & CT3)**	
		Power the microprocessor by toggling the Main Power switch out of the OFF position.	Unit AC Current #1 and #2 reading in Data List must be 0.0 ± 1.0 amp.
	9	**Defective Overload Ground Fault (OGF) Detector**	
		Opens prematurely.	Remove and replace.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
27	**HIGH SUCTION PRESSURE** • TRIGGER ON: The refrigeration system is running and the suction pressure has been greater than 98 psig (6.7 bar) for more than 10 minutes. • UNIT CONTROL: Engine Operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby Operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset when suction pressure is less than 75 psig (5.1 bar) for 5 minutes and configured for Alarm Only, or Auto Reset after 15 minutes if configured as a Shutdown Alarm or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.	Suction pressure must be above 3 psig (0.2 bar.) Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display. **NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.**
	2	**Check For Refrigerant Overcharge**	
		Check refrigerant level in the receiver.	Refer to Section 8.6.2.
	3	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	4	**Check EVXV**	
		a. Check wiring and connections to EVXV.	No physical damage to harness. No damage or corrosion in connectors. Connector tight on valve.
		b. Check operation of EVXV.	Refer to Section 8.8.6.
	5	**Check Compressor.**	
		a. Perform Pump-Down Test. Refer to Section 8.7.1	Must hold a vacuum and not equalize in a short period of time
		b. Cover condenser and build-up discharge pressure.	Must be able to pump up to 400 psig (27.2 bar.)
		c. Disassemble and inspect compressor valve plates, reeds, pistons, etc.	Must be intact, clean, and in good working order.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
28	**CHECK REFRIGERATION SYSTEM**		
	• TRIGGER ON: The compressor is running and the discharge pressure is less than 5 psig (0.34 bar) higher than suction pressure for more than 10 minutes. • UNIT CONTROL: Engine Operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby Operation: alarm only or (if configured for shutdown) refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto reset when discharge pressure is more than 20 psig (1.36 bar) above the suction pressure when in alarm only (for either trigger), or auto reset after Minimum Off Time Functional Parameter setting when shutdown is configured or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Verify Compressor Is Running.**	
		Check compressor amp draw on all three legs.	Readings must be in the range as shown in Section 2.11.
	2	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.	Suction pressure must be above 3 psig (0.2 bar) Discharge pressure must be more than 5 psig (0.3 bar) higher than the suction pressure. Suction & Discharge Pressures must have the same reading on gauges & on microprocessor display. **NOTE: Microprocessor suction (CSP) and evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar) The actual suction pressure must be lower than 100 psig in order to perform this test.**
	3	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	4	**Check Compressor.**	
		a. Perform Pump-Down Test. Refer to Section 8.7.1	Must hold a vacuum and not equalize in a short period of time
		b. Cover condenser and build-up discharge pressure.	Must be able to pump up to 400 psig (27.2 bar.)
		c. Disassemble and inspect compressor valve plates, reeds, pistons, etc.	Must be intact, clean, and in good working order.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.5 START UP / ENGINE ALARMS			
30		**FAILED TO RUN MINIMUM TIME** • TRIGGER–ON: The unit has shutdown on an alarm 3 times without having run for at least 15 minutes between each shutdown (not including Door shutdowns.) • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again. If the Unit Operation configuration is set to Rail Mode, this alarm will reset after 4 hours.	
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
		Check For Alarms	
		Check for shutdown alarms.	Alarm conditions must be corrected and the alarm(s) cleared to continue.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
31	**FAILED TO START - AUTO MODE** • TRIGGER–ON: Engine has tried to start three times unsuccessfully in the auto start mode. • UNIT CONTROL: Unit Shutdown & Alarm • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again. If the Unit Operation configuration is set to Rail Mode, this alarm will reset after 4 hours.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Flash Code on Engine Speed Control Unit (ENSCU).**	
		Check for flash codes on the ENSCU.	Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue.
	2	**Check Fuel Level in Tank.**	
		Check fuel gauge on tank.	Fill tank as needed.
	3	**Check For Alarms**	
		Check for the following alarms: 71 Check for Bad F2 or F3 Fuse alarm. 40 Check Glow Plug alarm. 35 Check Starter Circuit alarm.	Alarm conditions must be corrected and the alarm cleared to continue.
	4	**Check ENSCU Power**	
		a. Check run relay.	Using Component Test Mode, refer to Section 5.2.2, energize run relay.
		b. Check Run Relay LED.	Must be ON.
		c. Check voltage to ENSCU.	Must have +12 VDC between ENSCU13 and ENSCU19 and between ENSCU24 and ENSCU19 with Run Relay energized
		d. Inspect Fuel Solenoid Actuator (FSA) & connector pins & terminals.	No damage to FSA. No damage, moisture, or corrosion in connector.
		e. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		f. Check Splice Pack 6 (SP6) (See wiring schematic Section 10.)	No corrosion or oxidation. 12 VDC reading to + battery cable.
	5	**Check Fuel System**	
		a. Check fuel system prime.	No air in fuel system.
		b. Check fuel flow.	Unrestricted fuel flow through system.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
31	**FAILED TO START - AUTO MODE - Continued**		
	6	**Check Engine Air–intake Heater System** (This step only applies when the engine coolant temperature is less than 77°F (25°C.)	
		a. Check voltage to heater.	Must be 11 VDC or higher
		b. Check operation of intake air heater relay.	**CAUTION** **DO NOT leave the circuit energized for the full 5 minutes if full amperage is shown, as the intake air heater element life will be greatly shortened.** Using Component Test Mode, refer to Section 5.2.2, energize the intake air heater relay. LED 30 must be illuminated. Amperage must be correct, refer to Section 2.8 for correct electrical values.
	7	**Check Engine Air–intake System**	
		a. Check air cleaner indicator.	Flag must not be visible.
		b. Inspect air intake system.	Hoses & tubes in good condition. No kinks or restrictions.
	8	**Check For Correct Engine Oil**	
		Check for correct oil viscosity (weight) for conditions.	Refer to Section 2.8. Must be correct for ambient conditions.
	9	**Check Engine Exhaust System**	
		Inspect the exhaust system.	Must be clear and unobstructed.
	10	**Check Generator**	
		Check for proper preventative maintenance and operating precautions.	Refer to Section 8.9.9
	11	**Check Engine**	
		Check engine compression.	Refer to Engine Workshop manual

Alarm NO.	Steps	Alarm/Cause	Corrective Action
34	**ENGINE FAILED TO STOP** • TRIGGER–ON: When in Engine Operation, engine is turning more than 500 RPM for 20 seconds after unit shutdown or cycled off or Oil Pressure switch is closed longer than 20 seconds after unit shutdown or cycle off. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: this alarm will not activate in standby Operation. • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Engine Running**	
		Verify that engine is still running.	Engine should not be running.
	2	**Check For Bad Engine RPM Sensor Alarm**	
		Check for Alarm 130.	Alarm conditions must be corrected and the alarm cleared to continue.
	3	**Check Engine Oil Pressure Switch**	
		a. Inspect switch & connector pins & terminals.	No physical damage to switch. No damage or corrosion in connector.
		b. Check engine oil switch operation.	Contacts close on a pressure rise at 15 psig (1.02 bar.) Contacts open on a pressure fall at 12 psig (0.82 bar.)
	4	**Check Engine Oil Switch Harness**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Check for shorted circuit in harness, and continuity through the harness.	Energize circuit. (See Note 2 page 7–2.) Battery voltage reading (12-13 VDC) between wires in plug.
	5	**Check Fuel/Speed Actuator (FSA) & Circuit**	
		a. Check Run Relay LED.	LED 28 must be OFF.
		b. Check voltage at harness to ENSCU.	0 VDC between ENSCU13 and ENSCU19 and between ENSCU24 and ENSCU19
		c. Check FSA plunger.	Must be free to move to the stop position (extended out of the solenoid.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
35	**CHECK STARTER CIRCUIT** • TRIGGER–ON: Engine speed fails to reach 50 RPM during 2 start attempts. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: this alarm will not activate in standby Operation. • RESET CONDITION: Change unit to standby Operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check That Engine Has Actually Started**	
		Check that engine starts, runs for a few seconds then shuts off.	If NO, continue with Step 2 below. If YES, check wiring to RPM sensor for a broken wire.
	2	**Check Starter Relay Circuit**	
		a. Check operation of starter solenoid relay.	Energize Circuit. (See Note 2 page 7–2.) Relay contacts closed when SSR85 is grounded.
		b. Check relay socket and terminals.	No signs of discoloration from overheating. No corrosion.
		c. Check voltage to starter solenoid relay.	Negative lead on 85, Positive lead on 86 = 12 VDC. Negative lead on Gnd, Positive lead on 87 & 30 = 12 VDC.
		d. Inspect wiring to starter solenoid and starter motor. (See wiring schematic Section 10.)	No physical damage to wiring or battery cable end. No damage or corrosion in connections.
		e. Check voltage to starter solenoid.	Must be above 11.5 VDC.
		f. Check voltage to starter motor.	Must be above 10 VDC while cranking.
	3	**Check Fuel/Speed Actuator (FSA) & circuit**	
		a. Check Run Relay LED	LED 28 must be ON.
		b. Check for 12 VDC on the Run Relay circuit	Must be 0 VDC
		c. Check SPK20 for voltage	Must be 12 VDC
		d. Check ENSCU terminals 13 & 15 for voltage	Must be 12 VDC
		e. Check FSA plunger	Must be free to move
	4	**Check Starter**	
		a. Inspect starter and wiring. (See wiring schematic Section 10.)	No damage or corrosion. Wiring and battery cable must be clean and tight
		b. Check resistance of starter motor.	Refer to Section 2.12 for correct electrical values.
		c. Check amperage draw of starter.	Refer to Section 2.12 for correct electrical values.
	5	**Check Battery Voltage**	
		a. Inspect battery cable ends and posts.	Must be clean and tight. No corrosion.
		b. Test voltage at battery with unit off.	Must be above 11 VDC.
		c. Test specific gravity of battery.	Must be 1.225 or higher.
		d. Perform load test on battery.	(Follow battery manufacturer's procedure and guidelines.)
	6	**Check For Correct Engine Oil**	
		Check for correct oil viscosity (weight) for conditions.	Refer to Section 2.8. Must be correct for ambient conditions.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
36	**CHECK COOLANT TEMPERATURE** • TRIGGER–ON: Coolant temperature is below 32°F (0°C) after the engine has been running for 5 minutes. • UNIT CONTROL: Engine Operation: alarm only. Standby Operation: this alarm will not activate in standby Operation. • RESET CONDITION: Auto reset when coolant temperature is higher than 36°F (2.2°C) or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Coolant Temperature**	
		Check temperature of coolant or upper radiator hose	Must be above 32°F (0°C)
	2	**Check Engine Coolant Sensor**	
		a. Check resistance of engine coolant sensor (See Note 3 page 7–2.)	Refer to Section 8.9.10
		b. Check harness and control box connector pins and terminals. (See wiring schematic Section 10.)	No physical damage to harness No damage, moisture, or corrosion in connectors.
		c. Check voltage at harness connection to ENCT.	Must be 2.5 ± 0.5 VDC. This verifies microprocessor output and wiring to sensor.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
37	**CHECK LOW SPEED RPM** • TRIGGER–ON: The microprocessor is set for low engine speed operation, and engine speed is: less than 1200 rpm, or greater than 1500 rpm for more than 60 seconds (120 seconds when the microprocessor calls for a change from high to low speed, or when unit first starts). • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset if microprocessor is set for low engine speed operation and signal is: Between 1200 to 1500 RPM for 60 seconds, **or** Alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Model Number**	
		Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data.	Enter the correct number in Configurations. (Refer to Section 5.2.1.)
	2	**Check For Proper Voltage To The Engine Speed Control Unit (ENSCU) Pin 16. Check For Proper Voltage With Unit Running.**	
		Check ENSCU 16.	0 VDC between ENSCU 16 and ENSCU 19 (GND.)
	3	**Check Fuel/Speed Actuator (FSA)**	
		Check fuel/speed actuator.	Plunger must move in and out freely. Refer to Engine Manual.
	4	**Force Low Speed operation**	
		a. Using Functional Parameters, set the Low Speed Start Up Delay to 10 minutes.	Unit will run in low speed. RPM must be within range shown above for each specific model. Refer to Speed Control System Diagnotics, Section 9.5. Clear all fault codes before continuing.
		b. Check operation of Speed Relay LED.	LED 27 must be OFF.
		c.Check voltage at engine speed control unit (ENSCU) pin 16.	Must be 0 VDC.
	5	**Check Engine RPM**	
		a. Check actual engine RPM using hand held tachometer.	Refer to Table 2-1.
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM.
	6	**Check Engine Air–Intake System**	
		a. Check air cleaner indicator.	Flag must not be visible.
		b. Inspect air intake system.	Hoses & tubes in good condition. No kinks or restrictions.
	7	**Check Engine Fuel System**	
		a. Check fuel tank level.	Must have enough fuel to run engine.
		b Check fuel lines.	Connections are tight and not leaking. No kinks or sharp bends in the lines.
		c Check fuel screen.	Fuel screen is located in the inlet fitting to the lift pump. Screen must be clean.
		d Check fuel filters.	Fuel filters must be clean and allow full flow of fuel through them.
	8	**Check Engine Exhaust System**	
		Inspect the exhaust system.	Must be clear and unobstructed.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
38	**CHECK HIGH SPEED RPM**		
	• TRIGGER–ON: The microprocessor is set for high engine speed operation, and engine speed is: less than 1650 rpm, or greater than 1950 rpm for more than 60 seconds (120 seconds when the microprocessor calls for a change from low to high speed, or when unit first starts). • UNIT CONTROL: Engine Operation: alarm only. Standby Operation: this alarm will not activate in standby Operation. • RESET CONDITION: Auto Reset if microprocessor is set for high speed operation and the signal is between 1650 and 1950 for 60 seconds or change unit to standby Operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Model Number**	
		Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data.	Enter the correct number in Configurations. (Refer to Section 5.2.1.)
	2	**Check for proper voltage to the Engine Speed Control Unit (ENSCU) pin 16. Check for proper voltage with unit running.**	
		a. Check ENSCU 16.	12 VDC between ENSCU 16 and ENSCU19.
		b. Check circuit from ENSCU 16 to microprocessor connection MPQC3.	Must be 12 VDC at MPQC3 and ENSCU16.
	3	**Check Fuel/Speed Actuator (FSA) plunger**	
		Check plunger on fuel/speed actuator.	Must move in and out freely. Spring tension must hold rod firmly extended and in place.
	4	**Check FSA Harness**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Check resistance of fuel/speed actuator.	Refer to Section 2.12 for correct electrical values.
	5	**Force High Speed Operation**	
		a. Adjust set point to at least 20 degrees away from compartment temperature. If the unit does not immediately go into High Speed, ensure the Silent Mode Functional Parameter is set to OFF and/or the applicable High Speed Delay Configuration is set to OFF. (Reset following testing.)	The microprocessor will call for High Speed operation.
		b. Check operation of Speed Relay LED.	LED 27 must be ON. (If LED 27 is not on, the microprocessor is not calling for High Speed operation. Check Speed Overrides in Section 4.8.3 for more information.)
		c. Check voltage on the engine speed control unit (ENSCU, pin 16.)	Must be 12-14 VDC
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
38	**CHECK HIGH SPEED RPM - Continued**		
	6	**Check Engine RPM**	
		a. Check actual engine RPM using hand held tachometer.	Refer to Table 2-1.
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM.
	7	**Check Engine Air–Intake System**	
		a. Check air cleaner indicator.	Flag must not be visible.
		b. Inspect air intake system.	Hoses & tubes in good condition. No kinks or restrictions.
	8	**Check Engine Exhaust System**	
		Inspect the exhaust system.	Must be clear and unobstructed.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
39	**CHECK ENGINE RPM**		
	• TRIGGER–ON: In Engine Operation and Alarm 130 is not active and engine speed is less than 1250 rpm for 2 seconds or greater than 2100 rpm for 5 minutes or engine speed drops to less than 1200 rpm for 3 seconds after the engine speed has been greater than 1250 rpm. • UNIT CONTROL: Engine Operation: alarm only or (if configured for shutdown) engine and unit shutdown and alarm. Standby Operation: this alarm will not activate in standby Operation. • RESET CONDITION: Auto Reset if engine rpm is greater than 1150 and less than 2000 for 5 minutes or after 15 minutes if the engine has been shutdown or change unit to standby Operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Model Number**	
		Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data.	Enter the correct number in Configurations. (Refer to Section 5.2.1.)
	2	**Check For Flash Code On Engine Speed Control Unit (ENSCU)**	
		Check for flash codes on the ENSCU.	Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue.
	3	**Check Fuel/Speed Actuator**	
		Check plunger on fuel/speed actuator.	Must move in and out freely. Spring tension must hold rod firmly extended and in place.
	4	**Check Fuel System**	
		a. Check for Alarm 1.	Fill tank as needed.
		b. Check fuel flow.	Unrestricted fuel flow through system. Fuel not gelled.
		c. Check fuel system prime.	No air in fuel system.
	5	**Check Engine Air–Intake System**	
		a. Check air cleaner indicator.	Flag must not be visible.
		b. Inspect air intake system.	Hoses & tubes in good condition. No kinks or restrictions.
	6	**Force Low Speed Operation**	
		a. Using Functional Parameters, set the High Speed Delay for at least 10 minutes so the unit starts in low speed.	Unit will run in low speed. RPM must be within range shown above for each specific model. Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue.
		b. Check operation of Speed Relay LED.	LED 27 must be OFF when the microprocessor is calling for Low Speed.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
39	**CHECK ENGINE RPM - Continued**		
	7	**Check Low Speed Engine RPM**	
		a. Check actual engine RPM using hand held tachometer.	Refer to Table 2-1.
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM.
	8	**Force High Speed Operation**	
		a. Place unit in continuous run and adjust set point to at least 15 degrees away from refrigerated compartment temperature, and a temperature greater than 20°F (5.6°C) If the unit does not immediately go into High Speed, set the AIRFLOW Functional Parameter to HIGH.	The microprocessor will call for High Speed operation.
		b. Check operation of Speed Relay LED.	LED 27 must be ON. (If LED 27 is not on, the microprocessor is not calling for high speed operation. Check Speed Overrides in Section 4.8.3 for more information.)
	9	**Check high speed engine RPM**	
		a. Check actual engine RPM using hand held tachometer.	Refer to Table 2-1.
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
40	**CHECK GLOW PLUGS (This alarm applies to the Intake Air Heater)** • TRIGGER–ON: Engine Operation: Intake Air Heater amperage is less than 25 Amps, **or** greater than 70 Amps after 14 seconds of glow time (NOTE: This can only occur when the Engine Coolant Temperature is below 50°F (11°C) due to the glow time allowed. Refer to Table 4–1 for glow times. Standby Operation: This alarm will not activate in standby Operation. • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset if glow plug amperage is between 4 to 55 amps for at least 14 seconds during the glow cycle, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Model Number**	
		Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data.	Enter the correct number in Configurations. (Refer to Section 5.2.1.)
	2	**Check Glow Configuration**	
		Verify that the Glow configuration is set to INTAKE HEATER.	INTAKE HEATER must be the selection (Refer to Section 5.2.1 for configuration settings.)
	3	**Check Air Intake Heater circuit**	
		a. Inspect relay & socket.	No signs of discoloration from overheating. No damage, moisture, or corrosion in socket.
		b. Check operation of intake air heater relay.	**CAUTION** **DO NOT leave the circuit energized for the full 5 minutes if full amperage is shown, as the intake air heater element life will be greatly shortened.** Using Component Test Mode, refer to Section 5.2.2, energize the intake air heater relay. LED 30 must be illuminated. Amperage must be correct, refer to Section 2.8 for correct electrical values.
		c. Check voltage to Air Intake Heater.	Must be 11 VDC or higher.
	4	**Check Air Intake Heater circuit wiring**	
		a. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Check connection at Intake Air Heater.	Ring terminal is tight on terminal. No signs of overheating.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
41	**ENGINE STALLED** • TRIGGER–ON: The engine is running, RPM sensor is good, and engine speed is less than 10 RPM; **or** the engine is running, RPM sensor alarm is ON, and the Oil Pressure switch contacts are open. • UNIT CONTROL: Engine Operation: Engine and unit shutdown and alarm. Standby Operation: This alarm will not activate in standby Operation. • RESET CONDITION: Auto Restart after 15 minutes, or Alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Alarm 130 - Check RPM Sensor**	
		Check for alarm 130.	When Alarms 130 and 41 occur at the same time, generally the engine has run out or is running out of fuel. This causes the engine RPM to surge and drop. Check fuel tank and add fuel as necessary. Check fuel lines between the fuel tank and the fuel pump inlet for drawing air in.
	2	**Check For Flash Code On Engine Speed Control Unit (ENSCU)**	
		Check for flash codes on the ENSCU.	Refer to ENSCU LED Fault Chart, Section 9.5, must be no LED alarm codes occurring to continue.
	3	**Was Engine Shut Off Manually?**	
		Check for external cause.	Correct problem.
	4	**Check For Bad F2 Or F3 Fuse Alarm**	
		Check for alarm 71.	Alarm conditions must be corrected and the alarm cleared to continue.
	5	**Check Fuel System**	
		a. Check for Alarm 1.	Fill tank as needed.
		b. Check fuel flow.	Unrestricted fuel flow through system. Fuel not gelled.
		c. Check fuel system prime.	No air in fuel system.
		d. Check fuel system check valve from filter to injection pump.	Check valve must hold fuel and not leak back.
	6	**Check Fuel/Speed Actuator (FSA)**	
		a. Check Run Relay LED.	LED 28 must be ON.
		b. Check voltage to ENSCU.	Use Component Test Mode to energize Run Relay. (Refer to Section 5.2.2.) Must have 12.0 VDC or higher reading between ENSCU 13 and 19.
		c. Inspect ENSCU connector pins & terminals.	No damage, moisture, or corrosion in connector.
		d. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		e. Check resistance of FSA.	Refer to Section 2.12 for correct electrical values.
		f. Check operation of FSA.	Plunger must move in when energized.
		g. Check connections at splice points SP3, SP5 ans SP6.	Connections must be good condition. No loose or broken wires.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
41	**ENGINE STALLED - Continued**		
	7	**Check Engine Speed Sensor (ENSSN)**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	8	**Check Electrical System Amperage**	
		a. Check the configuration setting for Diesel Max Gen Amps.	Must be set for 22 - 25 Amps
		b. Check the configuration setting for Diesel Offset Max Amps.	Must be set for 4 Amps
		c. With the unit operating, check all 3 high voltage circuits for amperage.	Must be no more than 26 Amps.
	9	**Check engine air–intake system**	
		a. Check air cleaner indicator.	Flag must not be visible.
		b. Inspect air intake system.	Hoses & tubes in good condition. No kinks or restrictions.
	10	**Check engine exhaust system**	
		Inspect the exhaust system.	Must be clear and unobstructed.
	11	**Check engine**	
		a. Check Injection pump timing.	Timing must be correct.
		b. Check engine valve adjustment.	Rocker arm clearance must be correct.
		c. Check engine compression.	Compression must be above 400 psig (27.2 bar.)
	12	**Check refrigeration system**	
		Check discharge & suction pressures.	Must be within normal operating range for conditions.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.6 WARNING / STATUS ALARMS			
51	**ALTERNATOR NOT CHARGING (This alarm applies to the Battery Charger)** • TRIGGER–ON: Unit is running in either Engine or Standby Operation and the current flow is more than -1.0 amps (discharge) between the battery charger and the battery for 3 continuous minutes. • UNIT CONTROL: Engine Operation: alarm only or (if Alternator Check Shutdown configuration is set to YES (configured for shutdown) engine and unit shutdown and alarm. Standby Operation: alarm only regardless of configuration setting. • RESET CONDITION: Auto Reset (if not shutdown) when alternator is charging if not shutdown or change unit to standby Operation or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Microprocessor Current Sensor**	
		Check microprocessor current value.	Power up microprocessor in PC Mode. (Refer to Section 5.3.) Must be -2.0 to 1.5A with no load.
	2	**Check Wire Direction Through Current Sensor**	
		Visually inspect wire at current sensor.	Must go through current sensor in the direction of the arrow on the sensor: **away** from the F-5 fuse for units with a Main Power switch labeled Engine-Off-Standby **toward** the F-5 fuse for units with a Main Power switch labeled Start/Run-Off.
	3	**Check Battery Charger Wiring**	
		a. Check output & ground wire (unit OFF.)	Negative lead on Ground terminal Positive lead on Output terminal = same as battery voltage.
		b. Check battery charger input.	Check for AC voltage between SPX, SPY & (for 40 amp 3phase chargers) SPZ. Check fuses F7, F8 and (for 40 amp 3phase chargers) F29.
		c. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		d. Check output and ground wire voltages (unit running.)	When the unit is started, battery voltage at the battery will begin near 12.0 VDC, and slowly rise toward 13.5 VDC as the battery charges. **NOTE:** Do not test for voltage at the output connector of the battery charger without the connector being connected to the battery. Without the battery connected any reading will be very inaccurate. (Refer to Section 8.9.8 for more information on checking battery charger.)
	4	**Check For Add–on Equipment Drawing Too Much Current**	
		Check amperage of added–on components & accessories.	Total current draw including the actual unit current draw and all add–on components & accessories must be less than battery charger rating.
	5	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.

Alarm NO.	Steps	Alarm/Cause	Corrective Action

53 BOX TEMP OUT OF RANGE

- TRIGGER–ON:

  Condition One: If the unit is running in Pulldown Mode and the SAT is not greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull-Up Mode and the SAT is not above the RAT, the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  NOTE: If the Out-Of-Range Alarm Functional Parameter is set to OFF, the following conditions will not trigger an alarm or shutdown.

  Condition Two: If the refrigerated compartment temperature has been within ±2.7°F (±1.5°C) for perishable or +2.7°F (±1.5°C) for frozen of set point at least once since the unit was started and is now further away from set point than the limit set in the Out-Of-Range Alarm Functional Parameter [4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated.

  Condition Three: If a shutdown alarm occurs and the RAT is further away from set point than the limit set in the Out-Of-Range Alarm Functional Parameter [4°, 5°, or 7°F (2°, 3°, or 4°C)], the configured action (Alarm only after 30 minutes or Alarm and Shutdown after 45 minutes) will be activated regardless if the refrigerated compartment temperature has been in-range or not.

- UNIT CONTROL: Engine and standby Operation:
  If the microprocessor is not configured for shutdown, alarm only.
  If the microprocessor is configured for shutdown the unit will shutdown and alarm.

- RESET CONDITION:

  Condition 1: Auto Reset; If the unit is running in Pulldown Mode and the SAT is greater than 1°F (0.56°C) below the RAT **or** if the unit is running in Pull-Up Mode and the SAT is greater than the RAT.

  Condition 2 & 3: Auto Reset when the temperature is within ±2.7°F (±1.5°C) for perishable set points or +2.7°F (±1.5°C) for frozen set points.

  For any Condition: alarm may be manually reset via Keypad OR by turning the unit off, then back on again.

NOTE: The 30, or 45 minute timer is reset and starts again whenever:

- The unit cycles off and restarts in Start-Stop.
- The unit goes into and comes out of Defrost.

NOTE: This alarm does not go into the Inactive alarm List when it becomes inactive or is cleared.

NOTE: This alarm will not be activated in Sleep Mode.

NOTE: For Condition Two, the temperature criteria for this alarm is reset, and the refrigerated compartment temperature must again go In Range before this alarm can be activated if any of the following occur:

- Pretrip is started.
- Set point is changed.
- A door switch or remote switch is installed and configured as a door switch, and the switch is opened indicating that the compartment door has been opened.

Troubleshooting steps begin on the next page.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
53	**BOX TEMP OUT-OF-RANGE - Continued**		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7−2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Compartment Doors**	
		Inspect all trailer compartment doors.	Must be closed, no air leakage.
	2	**Defrost Evaporator**	
		Initiate Manual Defrost Cycle.	Must terminate automatically. All ice cleared from evaporator coil.
	3	**Check For Any Shutdown Alarm(s)**	
		Check the Alarm List for any Shutdown Alarms.	Alarm conditions must be corrected and the alarm cleared to continue.
	4	**Check For Low Refrigerant Pressure Alarm**	
		Check for alarm 18.	Alarm conditions must be corrected and the alarm cleared to continue.
	5	**Check Refrigerant Level**	
		Visually check refrigerant level in receiver.	Must be at correct level. Refer to Section 8.6.2.
	6	**Check System Pressures**	
		Install manifold gauge set and check system pressures.	Suction & Discharge Pressures must be in the normal range. Suction & Discharge Pressures must have the same reading on gauges & on micro display.
	7	**Check Evaporator Motor or Contactor Alarm**	
		Check for alarm 77 or 109.	Must be corrected and cleared to continue.
	8	**Verify accuracy of RAT & SAT sensors**	
		Verify accuracy of RAT & SAT using infrared or other accurate temperature testing tool.	RAT & SAT readings must be within ±3°F (1.7°C) of test temperature tool reading.
	9	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	10	**Check For Low Delta-T**	
		Read Delta-T from Unit Data.	In Cool, the Delta-T must be greater than(cooling more than) -1°F (-0.56°C.) In Heat the Delta-T must be greater than 0 (SAT must be higher than RAT.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
54	**DEFROST NOT COMPLETE** • TRIGGER–ON: Defrost cycle did not complete within 45 minutes • UNIT CONTROL: Engine and standby Operation: alarm only. While this alarm is active, the Defrost Timer will be set to initiate a defrost cycle 90 minutes (1.5 hours) of unit running time after the alarm comes on. • RESET CONDITION: Auto Reset when defrost cycle is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	2	**Check For Defective Defrost Sensor Location/Correct Installation**	
		Has sensor fallen from location?	Must be corrected to continue.
	3	**Check Evaporator Fan Contactors**	
		Check that contactors are not energized and that the contacts are not stuck closed in defrost.	Must de-energize evaporator fan during defrost.
	4	**Check Evaporator Heater Current Draw**	
		a. Check Heater amp draw at 1HTCON1 & 1HTCON2	These checks must be made with the unit operating. Verify that all three actual amperage readings for each component are within 10% of each other, and are within the values shown in section 2.11.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
55	**CHECK DEFROST AIR SWITCH**		
	• TRIGGER–ON: The defrost air switch has called for a defrost cycle within 8 minutes of a defrost termination for 2 consecutive defrost cycles. (The air switch contacts were closed continuously for 15 seconds before the defrost cycle was started.) • UNIT CONTROL: Engine and standby Operation: alarm only. While this alarm is active, the defrost air switch will NOT be used to initiate a defrost cycle; however the Defrost Timer will initiate a defrost cycle 90 minutes after the alarm comes on, and the manual defrost switch will remain operative. • RESET CONDITION: Auto Reset when defrost cycle terminates correctly, and the air switch does not call for a defrost cycle within the 8 minutes following defrost termination, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Condition Of Refrigerated Compartment & Load**	
		a. Check condition of refrigerated compartment doors & seals.	Doors must be closed, and door seals must seal and prevent entrance of outside air.
		b. Check condition of evaporator.	Check for blockage sufficient to cause an air pressure differential across the coil great enough to close the contacts of the defrost air switch. Coil must be free of ice following defrost.
		c. Check condition of product.	If product is warm and moist, frequent defrost cycles can be expected.
	2	**Check Switch Wiring**	
		a. Inspect switch & connector pins & terminals.	No physical damage to switch. No damage or corrosion in connector.
		b. Check switch circuit. (See wiring schematic Section 10.)	Check wiring from switch to microprocessor terminal 2MP6 is not shorted to a power source, providing a false signal.
	3	**Check Defrost Air Switch, Defrost Circuit and Tubing**	
		a. Perform testing and reset switch if required.	Refer to Section 8.8.9 page 8–31.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
57	**CHECK REMOTE SWITCH 1 (REMS1)**		
	• TRIGGER–ON: Remote Switch 1 is set to activate an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds. • UNIT CONTROL: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown. • RESET CONDITION: Alarm Only: Auto Reset after the switch has de-activated for more than five seconds. Shutdown: Auto Reset after three minutes (minimum off time for door open condition) and the switch has de-activated for more than five seconds.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
		IF A SWITCH IS INSTALLED	
	1	**Determine what REMS1 is controlled by.**	
		REMS1 may be connected to a compartment door or some other device and used to remotely control the unit.	Locate the device used as REMS1.
	2	**Check To See If REMS1 Has Activated**	
		Inspect device used to activate REMS1.	For example, Compartment door must be closed, and switch must be de-activated.
	3	**Check “REMS1 (Remote Switch 1)” Configuration**	
		Verify that Configuration is set for the type of switch being used (i.e. when switch is activated, switch contacts are closed; etc.)	Configuration must agree with switch type. Refer to “REMS1 (Remote Switch 1)” Configuration, Table 5–2.
	4	**Check Wiring**	
		a. Visually inspect wiring to Remote Switch #1.	Wiring must be connected.
		b. Visually inspect condition of switch	Must not be damaged, wet, corroded, etc.
		c. Check circuit. (See wiring schematic Section 10.)	With the switch contacts closed, check for 12 VDC through the wiring and switch to the correct microprocessor terminal (refer to applicable wiring schematic - Section 10).
	5	**Temporary Solution Tip**	
		In the event of a defective switch that can not be repaired or replaced, and the switch is forcing the unit into a shutdown, this alarm may be temporarily overridden by setting the correct Functional Parameter.	In the Functional Parameter list set OVERRIDE REMS1 SHUTDOWN to YES.
		IF A SWITCH IS NOT INSTALLED	
		Locate and inspect 10 position connector for optional sensors and switches (REMSN, see wiring schematic Section 10).	Connector must have cap on, No corrosion or moisture inside connector. If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink.

Alarm NO.	Steps	ALARM / CAUSE	CORRECTIVE ACTION
58	**CHECK REMOTE SWITCH 2 (REMS2)**		
	• TRIGGER–ON: Remote Switch 2 is set to activate an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds. • UNIT CONTROL: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown. • RESET CONDITION: Alarm Only: Auto Reset after the switch has de-activated for more than five seconds. Shutdown: Auto Reset after three minutes (minimum off time for door open condition) and the switch has de-activated for more than five seconds.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
		IF A SWITCH IS INSTALLED	
	1	**Determine what REMS2 is controlled by.**	
		REMS2 may be connected to a compartment door or some other device and used to remotely control the compartment.	Locate the device used as REMS2.
	2	**Check To See If REMS2 Has Activated**	
		Inspect device used to activate REMS2.	For example, compartment door must be closed, and switch must be de-activated.
	3	**Check "REMS2 (Remote Switch 2) Configuration**	
		Verify that Configuration is set for the type of switch being used (i.e. when switch is activated, switch contacts are closed; etc.)	Configuration must agree with switch type. Refer to "REMS2 (Remote Switch 2)" Configuration, Table 5–2.
	4	**Check Wiring**	
		a. Visually inspect wiring to Remote Switch #2.	Wiring must be connected.
		b. Visually inspect condition of switch	Must not be damaged, wet, corroded, etc.
		c. Check circuit. (See wiring schematic Section 10.)	With the switch contacts closed, check for voltage from microprocessor terminal 2MP13, through the wiring and switch to ground.
	5	**Temporary Solution Tip**	
		In the event of a defective switch that can not be repaired or replaced, and the switch is forcing the unit into a shutdown, this alarm may be temporarily overridden by setting the correct Functional Parameter.	In the Functional Parameter list set OVERRIDE REMS2 SHUTDOWN to YES.
		IF A SWITCH IS NOT INSTALLED	
		Locate and inspect 10 position connector for optional sensors and switches (REMSN, see wiring schematic Section 10).	Connector must have cap on, No corrosion or moisture inside connector. If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
59	**DATALOGGER (DataLink data recorder) NOT RECORDING** • TRIGGER–ON: No data is being recorded by the DataLink data recorder. • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Alarm may be manually reset via keypad.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Clear Alarm**	
		a. Clear Active Alarm(s).	Alarms Clear.
		b. Check for Active Alarm re-occurrence.	If Inactive, download all data & retain. If Active, go to next step.
	2	**Microprocessor Defective**	
		a. Download previous data using Download PC Card, or ReeferManager Program.	Data retrieval OK.
		b. Replace microprocessor & set Configurations, Functional Parameters, Enter hours from removed microprocessor, set Maintenance Hour Meters, and DataLink data recorder Setup.	New microprocessor in place.
NOTE: Specific configurations may be found on the TransCentral Website (Authorized Carrier Transicold Dealers only.)			

Alarm NO.	Steps	Alarm/Cause	Corrective Action
60	**DATALOGGER (DataLink data recorder) TIME WRONG** • TRIGGER–ON: The real time clock in the Data Recorder does not contain a valid date. • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset when the DataLink data recorder real time clock is reset, or alarm may be manually reset by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Real Time Clock**	
		Check Real Time Clock in the Data List, or using ReeferManager.	Must show correct date and time. Change as needed (Configuration List).
	2	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds and then return it to the desired position.	Microprocessor powers up OK.
		b. Check for valid Real Time Clock reading in Data List.	Valid date and time in memory. Alarm is cleared automatically.
		c. Real Time Clock can not be changed.	Replace microprocessor.
	3	**Microprocessor Defective**	
		a. Download previous data using Download PC Card, or ReeferManager Program.	Data retrieval OK.
		b. Replace microprocessor & set Configurations, Functional Parameters, Enter hours from removed microprocessor, set Maintenance Hour Meters, and DataLink data recorder Setup.	New microprocessor in place.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
61	**DOOR OPEN (DS1)**		
	• TRIGGER–ON: DS1 is set to activate an alarm if the switch is activated (opened or closed, depending on switch type) for more than five seconds. • UNIT CONTROL: May be configured as alarm only, alarm and force low engine speed or alarm and shutdown. • RESET CONDITION: Alarm Only: Auto Reset after the switch has de-activated for more than five seconds. Shutdown: Auto Reset after three minutes (minimum off time for door open condition) and the switch has de-activated for more than five seconds.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
		IF A SWITCH IS INSTALLED	
	1	**Determine what DS1 is controlled by.**	
		DS1 may be connected to a compartment door or some other device and used to remotely control the unit.	Locate the device used as DS1.
	2	**Check To See If DS1 Has Activated**	
		Inspect device used to activate DS1.	For example, compartment door must be closed, and switch must be de-activated.
	3	**Check “DOOR SWITCH” Configuration**	
		Verify that Configuration is set for the type of switch being used (i.e. when switch is activated, switch contacts are closed; etc.)	Configuration must agree with switch type. Refer to “door switch) Configuration, Table 5–2.
	4	**Check Wiring**	
		a. Visually inspect wiring to DS1	Wiring must be connected.
		b. Visually inspect condition of switch	Must not be damaged, wet, corroded, etc.
		c. Check circuit. (See wiring schematic Section 10.)	With the switch contacts closed, check for 12 VDC through the wiring and switch to the correct microprocessor terminal (refer to applicable wiring schematic - Section 10).
	5	**Temporary Solution Tip**	
		In the event of a defective switch that can not be repaired or replaced, and the switch is forcing the unit into a shutdown, this alarm may be temporarily overridden by setting the correct Functional Parameter.	In the Functional Parameter list set OVERRIDE REMS1 SHUTDOWN to YES.
		IF A SWITCH IS NOT INSTALLED	
		Locate and inspect 10 position connector for optional sensors and switches (REMSN, see wiring schematic Section 10).	Connector must have cap on, No corrosion or moisture inside connector. If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.7 ELECTRICAL ALARMS			
71	**BAD F2 OR F3 FUSE** • TRIGGER–ON: One or more of the following fuse circuits have been open for more than 2 seconds: F2, F3 • UNIT CONTROL: Engine Operation: Alarm Only. If the engine shut off, see troubleshooting steps below to correct. Standby Operation: Additional verification required if the "NO A/C POWER" configuration is set for "Installed and shutdown", the refrigeration system will shutdown with the alarm on and PSCON still energized. • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). See Note 1 page 7–2. Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Unit Operation**	
		Did engine shutdown?	Yes Check F3. No Check F2.
	2	**Check Fuses**	
		a. Locate blown fuse(s).	Will have open circuit.
		b. Verify fuse size.	Refer to Section 2.13 for correct electrical values. Must be correct rating for circuit. (See wiring schematic. Section 10.)
		c. Inspect fuse & fuse holder.	Terminals tight; No signs of overheating, melting or discoloration.
	3	**Check Circuit**	
		a. Check amperage draw on Speed Relay circuit.	Refer to Section 2.13 for correct electrical values.
		b. Check amperage draw on Run Relay circuit.	Refer to Section 2.13 for correct electrical values.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
73	**NO A/C POWER-CHECK POWER CORD**		
	• TRIGGER–ON: The unit is set to operate in standby AND no AC power		
	• UNIT CONTROL: Engine Operation: this alarm will not activate in Engine Operation. Standby Operation: If the “NO POWER SWITCH TO DIESEL” Functional Parameter is set to “No” or the “NO POWER SWITCH TO DIESEL” Functional Parameter is set to “Yes” and the “NO A/C POWER” Configuration is set for “Alarm and shutdown” the refrigeration system will shutdown (because of the loss of power) with the alarm on and PSCON still energized. If the “NO POWER SWITCH TO DIESEL” Functional parameter is set to “Yes” and the “NO A/C POWER” Configuration is set to “Switch To Diesel” the unit will remain off for 5 minutes, then start the engine. The unit will remain in Engine Operation until the minimum run time has expired (regardless if the unit is set for Start Stop or Continuous) and until standby power has been restored continually for 5 minutes.	
	• RESET CONDITION: Auto Reset when AC power is restored or the alarm may be manually reset via keypad or by turning the unit off, then back on. If the unit is running in Engine Backup when the A/C power has been restored for 5 continuous minutes and the above conditions have been met, the engine will stop and the unit will restart in Standby Operation.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Circuit Breaker On The Main External Power Supply**	
		a. Check circuit breaker.	30A supply circuit breaker - Must be on.
		b. Check the voltage in the plug.	460V / 3 / 60Hz.
	2	**Check Power Cord**	
		a. Inspect connections in the socket and the plug.	Connections must be tight.
		b. Inspect the cable.	Cable must not be frayed, cut or damaged.
	3	**Check For Power In The Control Box**	
		a. Check for voltage at PSCON L1-L2, L2-L3, L1-L3.	All three readings must be 460V ±10% .
		b. Check for voltage at PSCON2 L1-L2, L2-L3, L1-L3.	All three readings must be 460V ±10%.
	4	**Check Connections**	
		Check for bad connections in the control box.	Connections and wire crimps must be tight.
	5	**Check Phase Reversal Module (PRM)**	
		a. Check for voltage at 5MP04.	Must be +12 VDC.
		b. Check Phase Reversal Module for correct operation.	See Section 8.9.2. Replace PRM if defective.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
75	**COMP MOTOR OVERLOAD** • TRIGGER–ON: Compressor Motor Internal Protector (IPC) circuit is open. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset when motor overload input is within limits, or change to engine Operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Alarm13 (A13 or I13 = High Pressure)**	
		Alarm 13 will always cause this alarm to activate, even when there are no problems with this circuit.	Review steps for Alarm 13 and correct if necessary.
	2	**Check For 12 VDC At 4MP1**	
		a. If 12VDC.	Alarm should have cleared itself.
		b. If no power (0VDC.)	Continue with step 3.
	3	**Check IPC circuit**	
		a. Use Component Test Mode to energize CCON circuit (Refer to Section 5.2.2.)	FET 2 will be on.
		b. Check IPC harness to microprocessor.	12 VDC on terminals 8 & 9 at the compressor (white wires.)
		c. Check SP15.	There should be 12 VDC from HP1 to SP15 to IPC.
		d. Test continuity through IPC.	Should be 0 Ohms. If compressor body is extremely warm, allow it to cool off, then recheck IPC continuity.
		e. Test IP circuit from compressor motor to microprocessor.	12 VDC at 4MP1.
	4	**Check Compressor Motor Contactor**	
		a. Inspect the wire connections to the contactor. (See wiring schematic Section 10.)	No signs of overheating of the contactor. Wiring is routed correctly to the contactor.
		b. Check tightness of the contactor wire connections.	Tighten with screwdriver and check for discoloration of wires.
	5	**Perform Pretrip**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	6	**Check Compressor Motor Operation**	
		Turn the unit ON in Engine or Standby Operation.	Check voltage and current on each phase (voltage and amperage must be within allowable range (Refer to Section 2.11 for correct electrical values.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
76	**CONDENSER MOTOR OVERHEATED**		
	• TRIGGER–ON: One or both of the condenser fan motor Internal Protectors (IP-CDM1 AND 2) circuit is open. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm with PSCON still energized. • RESET CONDITION: Auto Reset when motor overload input is within limits, or change to engine Operation, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Condenser Fan Blades for Free Operation**	
		Visually inspect condenser fan blades for any foreign material or damage or anything that will prevent the blade and motor from turning freely	Fan blade must be in good condition. No sticks or other material obstructing it's movement No ice build-up preventing blade rotation.
	2	**Check For 12 VDC At 4MP2**	
		a. If 12VDC.	Alarm should have cleared itself.
		b. If no power (0VDC.)	Continue with step 2 below.
	3	**Check IPC circuit**	
		a. Check MPQC9.	There should be 12 VDC from MPQC9 to Ground.
		b. Use Component Test Mode to energize CDCON circuit. (Refer to Section 5.2.2.)	FET 1 will be on.
		c. Unplug the connector to condenser fan motor 1 (CDM1) and check voltage on pins 4-5 in the engine harness connector.	12 VDC between pin 4 and pin 5 indicates the open circuit is in the IP for CDM1.
		d. Test continuity through CDM1 IP at pins 4-5 in the fan motor harness connector.	Should be 0 Ohms. If condenser fan motor 1 is extremely warm, allow it to cool off, then recheck IP continuity.
		e. Test continuity through IPC.	Should be 0 Ohms. If either condenser fan motor is extremely warm, allow it to cool off, then recheck IPC continuity.
		f. Test IP circuit from condenser fan motor wires to microprocessor.	12 VDC at 4MP2.
	4	**Check Condenser Fan Motor Contactor**	
		a. Inspect the wire connections to the contactor. (See wiring schematic Section 10.)	No signs of overheating of the contactor. Wiring is routed correctly to the contactor.
		b. Check tightness of the contactor wire connections.	Tighten with screwdriver and check for discoloration of wires.
	5	**Perform Pretrip**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
76	**CONDENSER MOTOR OVERHEATED - Continued**		
	6	**Check Condenser Fan Motors**	
		Disconnect power plug at motor.	Test IP circuit for continuity using ohmmeter. If open, remove and replace motor. If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits. Refer to Section 2.11 for correct electrical values. If motor tests good, check the DC IP circuit to microprocessor.
	7	**Check Motor Operation**	
		Turn the unit ON.	Check current on each phase (must be less than shown on Section 2.11.) Check voltage on each phase (must be within voltage limits shown in Section 2.11.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
77	**EVAP MOTOR OVERHEATED** • TRIGGER–ON: The evaporator fan motor Internal Protector (IP-EVM) is open. • UNIT CONTROL: Engine and Standby Operation: shutdown and alarm • RESET CONDITION: Auto Reset after a 15 minute off time when motor overload input is within limits or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Evaporator Fan Blades for Free Operation**	
		Visually inspect evaporator fan for any foreign material or damage or anything that will prevent the blade and motor from turning freely	Blower wheel must be in good condition. No sticks or other material obstructing its movement No ice build-up preventing blade rotation.
	2	**Check For 12 VDC At 4MP3**	
		a. If 12VDC	Alarm should have cleared itself.
		b. If no power (0VDC)	Continue with step 2 below.
	3	**Check IPC Circuit**	
		a. Use Component Test Mode to energize Evaporator Motor Contactor circuit. (Refer to Section 5.2.2.)	FET 20 will be on.
		b. Unplug the connector to the evaporator fan motor and check voltage on IP-EVM (white) wire.	12 VDC between pin 4 in the engine harness connector and Ground.
		c. Check MPQC9.	There should be 12 VDC from MPQC9 to Ground.
		d. Test continuity through IPC.	Should be 0 Ohms. If the evaporator fan motor is extremely warm, allow it to cool off, then recheck IPC continuity.
		e. Test IP circuit from evaporator fan motor junction box to microprocessor.	12 VDC at 4MP3
	4	**Check Evaporator Fan Motor Contactor**	
		a. Inspect the wire connections to the contactor. (See wiring schematic Section 10.)	No signs of overheating of the contactor. Wiring is routed correctly to the contactor.
		b. Check tightness of the contactor wire connections	Tighten with screwdriver and check for discoloration of wires.
	5	**Perform Pretrip**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
77	**EVAP MOTOR OVERHEATED - Continued**		
	6	**Check Evaporator Fan Motor**	
		Disconnect power plug at motor	Test IP circuit for continuity using ohmmeter If open, remove and replace motor If closed, then an intermittent IP circuit is suspect. Check phase to phase and phase to ground for short or open circuits. Refer to Section 2.11 for correct electrical values. If motor tests good, check the DC IP circuit to microprocessor.
	7	**Check Motor Operation**	
		Turn the unit ON	Check current on each phase (must be less than shown on Section 2.11). Check voltage on each phase (must be at within limits shown in Section 2.11.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
84	**CHECK REMOTE ALARM LIGHT** • TRIGGER–ON: The fault output circuit (amber “check unit” LED’s) to the light bar is shorted. (This output [3MP19] from the microprocessor is negative, so the circuit will not be shorted to ground, but is shorted either within the remote alarm light itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset when Alarm light current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check 2-Light Bar Wiring**	
		a. Inspect light bar & connector.	No damage to light bar. No damage, moisture, or corrosion in connector.
		b. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	2	**Check 2-Light Bar**	
		Check operation of 2-Light Bar	Refer to Section 8.9.3 for information on testing the 2-Light Bar.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
85	**CHECK UL1 CIRCUIT** • TRIGGER–ON: Front Unloader (UL1) circuit is shorted. (The UL1 output from the microprocessor (3MP12) is negative, so the circuit will not be shorted to ground, but is shorted either within UL1 itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset when the UL1 Coil current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Front Unloader (UL1) Coil**	
		a. Inspect Front Unloader (UL1) coil & connector.	No damage to coil No damage, moisture, or corrosion in connector.
		b. Check resistance of coil	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12 for correct electrical values. Use ammeter.
	2	**Check Front Unloader (UL1) Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	3	**Check Front Unloader (UL1) Coil Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
86	**CHECK UL2 CIRCUIT** • TRIGGER–ON: Rear Unloader (UL2) circuit is shorted. (The UL2 output from the microprocessor (3MP23) is negative, so the circuit will not be shorted to ground, but is shorted either within UL2 itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset when the UL2 Coil current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Rear Unloader (UL2) Coil**	
		a. Inspect Rear Unloader (UL2) coil & connector.	No damage to coil. No damage, moisture, or corrosion in connector.
		b. Check resistance of coil.	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12. Use ammeter.
	2	**Check Rear Unloader (UL2) Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	3	**Check Rear Unloader (UL2) Coil Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
89	**CHECK REMOTE AUTO LIGHT (Light Bar)**		
	• TRIGGER–ON: The normal operation output circuit (green “Status OK” light) to the light bar is shorted. (The light bar output from the microprocessor [3MP32] is negative, so the circuit will not be shorted to ground, but is shorted either within the light bar itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset when Auto light current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check 2-Light Bar Wiring**	
		a. Inspect light bar & connector.	No damaged to light bar No damage, moisture, or corrosion in connector.
		b. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	2	**Check 2-Light Bar**	
		Check operation of 2-Light Bar	Refer to Section 8.9.3 for information on testing the 2-Light Bar.
91	**CHECK 1HTCON1 RELAY COIL**		
	• TRIGGER–ON: Heater Contactor 1 (1HTCON1) circuit is shorted. (The contactor output from the microprocessor (4MP13) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check 1HTCON1**	
		a. Inspect heater contactor relay coil and connector.	No damage to coil. No damage, moisture, or corrosion in connector.
		b. Check contactor coil resistance.	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12 for correct electrical values. Use ammeter.
	2	**Check 1HTCON1 Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	3	**Check 1HTCON1 Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
92	**CHECK 1HTCON2 RELAY COIL** • TRIGGER–ON: Heater contactor 2 (1HTCON2) circuit is shorted. (The contactor output from the microprocessor (4MP14) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check 1HTCON2**	
		a. Inspect heater contactor coil and terminals	No damage to coil No damage or corrosion.
		b. Check contactor coil resistance	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12 for correct electrical values. Use ammeter.
	2	**Check 1HTCON2 Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values View current draw in Data List.
	3	**Check 1HTCON2 Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
93	**CHECK START UP BUZZER**		
	• TRIGGER–ON: The Buzzer (B) circuit is shorted. (The Buzzer output from the microprocessor [5MP08] is negative, so the circuit will not be shorted to ground, but is shorted either within the Buzzer itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset when Buzzer amp draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Buzzer**	
		a. Inspect Buzzer & wire connections.	No damage to buzzer. No damage or corrosion.
		b. Check resistance of buzzer.	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
	2	**Check Buzzer Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	3	**Check Buzzer Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
94	**CHECK COMP CONTACTOR 1**		
	• TRIGGER–ON: Compressor motor contactor relay (CCONR) circuit is shorted. (The relay output from the microprocessor (4MP5) is negative, so the circuit will not be shorted to ground, but is shorted either within the relay coil itself, or to a positive wire.). • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check CCONR**	
		a. Inspect compressor contactor relay coil and terminals.	No damage to coil. No damage or corrosion.
		b. Check contactor coil resistance.	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12 for correct electrical values. Use ammeter.
	2	**Check CCONR Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	3	**Check CCONR Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
95	**CHECK CDCON RELAY COIL** • TRIGGER–ON: Condenser fan motor contactor (CDCON) circuit is shorted. (The contactor output from the microprocessor (4MP6) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check CDCON**	
		a. Inspect condenser fan contactor coil and terminals.	No damage to coil. No damage or corrosion.
		b. Check contactor coil resistance.	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12 for correct electrical values. Use ammeter.
	2	**Check CDCON Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	3	**Check CDCON**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
96	**CHECK GENCONR RELAY COIL** • TRIGGER–ON: Generator contactor relay (GENCONR) circuit is shorted. (The relay output from the microprocessor (4MP7) is negative, so the circuit will not be shorted to ground, but is shorted either within the relay coil itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check GENCONR**	
		a. Inspect generator contactor relay coil and terminals.	No damage to coil. No damage or corrosion.
		b. Check contactor coil resistance.	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12 for correct electrical values. Use ammeter.
	2	**Check GENCONR Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	3	**Check GENCONR Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
98	**CHECK HIGH TEMP THERMOSTAT** • TRIGGER–ON: With the Main Power switch toggled out of the OFF position, the 1EVHTS circuit is open. • UNIT CONTROL: Alarm AND no heat allowed. • RESET CONDITION: Auto Reset when the 1EVHTS circuit is okay for 15 minutes, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Evaporator Area For High Temperature**	
		Check Evaporator temperature using a test thermometer.	EVHTS opens when the temperature of the evaporator becomes very high (Refer to Section 2.10). (For example, if the heaters are on when the fan is not running.) If the temperature of the evaporator section is very warm (hot), it will have to cool down before the EVHTS closes.
	2	**Check High Temperature Thermostat (EVHTS)**	
		Inspect thermostat and connector. (See wiring schematic Section 10.)	No damage to thermostat. No damage or corrosion in connector.
	3	**Check High Temperature Contacts**	
		a. Contacts must be closed when temperature is normal. Unplug EVHTS and check for continuity.	Must be 0 (zero) Ohms. Cannot be opened (infinite ohms) or shorted to ground.
		b. Check for 12VDC on MPQC9.	12 VDC at MPQC9 Unplug EVHTS and check for 12 VDC at EVHTS pin A harness connector. Visually inspect and repair wiring as needed.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
99	**CHECK STANDBY CONTACTOR** • TRIGGER–ON: Standby motor contactor relay (PSCONR) circuit is shorted. (The relay output from the microprocessor (5MP7) is negative, so the circuit will not be shorted to ground, but is shorted either within the relay coil itself, or to a positive wire.) • UNIT CONTROL: Engine and Standby Operation: alarm only. In engine Operation, the unit will continue to operate. In Standby the refrigeration system will not operate. • RESET CONDITION: Auto Reset when the PSCONR Coil current (amp) draw is normal, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check PSCONR**	
		a. Inspect standby contactor relay coil and terminals.	No damage to coil. No damage or corrosion.
		b. Check contactor coil resistance.	Refer to Section 2.12 for correct electrical values. Cannot be opened (infinite ohms), shorted (Zero Ohms) or shorted to ground.
		c. Check amp draw of coil.	Refer to Section 2.12 for correct electrical values. Use ammeter.
	2	**Check PSCONR Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	3	**Check PSCONR Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
100	**OVERLOAD/GROUND FAULT** • TRIGGER–ON: Engine or Standby Operation is being called for and the overload ground fault module is reading more than 40 Amps on any A/C current leg OR there is A/C voltage leaking to ground of more than 150 miliamps. • UNIT CONTROL: Engine Operation: engine and unit shutdown and alarm. Standby Operation: refrigeration system shutdown and alarm. • RESET CONDITION: Auto Reset in Engine Operation. Alarm may be manually reset via Keypad or, alarm may be reset by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check (Overload Ground Fault Detector (OGF) LED**	
		Check status LED	LED is On - Ground Fault is detected. Start with Step 3 below. LED is Off - Circuit Overload is detected. Start with Step 2 below.
	2	**Check For Electrical Overload**	
		Check high voltage amp draw from GENCON if running in Engine Operation or PSCON2 if running in standby Operation.	Must be less than 40 Amps.
	3	**Check For High Voltage Short To Ground**	
		a. Check resistance between T1, T2 and T3 for **ALL** High voltage contactors to ground.	Reading must be greater than 25,000 Ohms.
		b. Perform Megohmmeter test on all high voltage circuits.	See Section 8.9.
	4	**Perform Pretrip Check**	
		a. Clear Active Alarm list, then run Pretrip & check for any new alarms.	Note during which test Alarm 100 occurs.
		b. Further test circuit from Step a. above.	Use a megohmmeter to test.
	5	**Check Overload / Ground Fault Device**	
		With the engine OFF and standby power disconnected, start the unit in Engine Operation.	Must have 12 VDC at HC19 and 2MP26. Refer to Section 8.9.4 for checking OGF.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
109	**CHECK 1EVCON RELAY COIL** • TRIGGER–ON: Evaporator fan motor contactor (1EVCON) circuit is shorted. (The contactor output from the microprocessor (4MP15) is negative, so the circuit will not be shorted to ground, but is shorted either within the contactor coil itself, or to a positive wire.) • UNIT CONTROL: Alarm only • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check 1EVCON**	
		a. Inspect evaporator fan contactor coil and terminals	No damage to coil No damage or corrosion.
		b. Check coil resistance	Cannot be opened (infinite ohms); Shorted (Zero Ohms) or shorted to ground
		c. Check amp draw of coil	Use ammeter.
	2	**Check 1EVCON Current Draw**	
		Use Component Test Mode to test actual current draw of the circuit. (Refer to Section 5.2.2.)	Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	3	**Check 1EVCON Wiring**	
		Inspect harness & control box connector pins & terminals (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.8 SENSOR ALARMS			
121	**CHECK AMBIENT AIR SENSOR** • TRIGGER–ON: Ambient Air Temperature Sensor (AAT) is not within the range of -53 to +158°F (-47° to +70° C.) • UNIT CONTROL: Engine and Standby Operation: A value of 122°F (50°C) will be used for any calculations. • RESET CONDITION: Auto Reset when Ambient Air Sensor is in range or alarm may be manually resetvia keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connector.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check sensor resistance. (See Note 3 page 7–2.)	10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP, See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor. See Note 2 page 7–2. Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
122	**CHECK RETURN AIR SENSOR** • TRIGGER–ON: Return Air Temperature Sensor (1RAT) is not within the range of -53 to +158°F (-47 to +70° C.) • UNIT CONTROL:Engine and Standby Operation: If Alarm 123 - Check Supply Air Sensor - is not active: alarm only and switch to supply air control. If Alarm 123 is also active (Cargo Protect Mode, refer to section 4.8.1) and the functional parameter Temperature Control is set for Return Air and the set point is in the perishable range: alarm and shutdown. If Alarm 123 is also active (Cargo Protect Mode, refer to section 4.8.1) and set point is frozen: alarm and unit will operate in reduced capacity COOL mode. (Refer to Section 4.8.1.) • RESET CONDITION: Auto Reset when Return Air Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connectors.	No damage to sensor No damage, moisture, or corrosion in connectors.
		b. Check sensor resistance (See Note 3, page 7–2.)	10,000 Ohms @ 77°F (25°C.) Refer to Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2, page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
123	**CHECK SUPPLY AIR SENSOR** • TRIGGER–ON: Supply Air Temperature Sensor (1SAT) is not within the range of -53 to +158°F (-47 to +70° C.) • UNIT CONTROL: Engine and standby: If Alarm 122 is not active and functional parameter Temperature Control is set for Supply Air and the set point for is in the perishable range: alarm only and switch to return air control. If Alarm 122 is active: set unit control as described in Alarm 122. • RESET CONDITION: Auto Reset when Supply Air Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connectors.	No damage to sensor. No damage, moisture, or corrosion in connectors.
		b. Check sensor resistance. (See Note 3, page 7–2.)	10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2, page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
124	**CHECK DEFROST TERM 1 SENSOR** • TRIGGER–ON: Defrost Termination Temperature Sensor (1DTT) is not within the range of -53° to +158°F (-47° to +70° C.) • UNIT CONTROL: Engine and standby: If Alarm 122 is not active: alarm and initiate defrost if 1RAT is below 45°F (7.2°C). If Alarm 122 is also active: alarm and initiate defrost if 1SAT is below 45°F (7.2°C). Under both of the above conditions, defrost will end after 10 minutes. If Alarms 122 and 123 are also both active: alarm and defrost will not be allowed. • RESET CONDITION: Auto Reset when 1DTT is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connectors.	No damage to sensor. No damage, moisture, or corrosion in connectors.
		b. Check sensor resistance. (See Note 3, page 7–2.)	10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
125	**CHECK COMP DISCHARGE SENSOR** • TRIGGER–ON: Compressor Discharge Temperature Sensor (CDT) is not within the range of –40° to +392°F (-40° to +200°C.) • UNIT CONTROL: Engine and Standby Operation: Alarm Only. • RESET CONDITION: Auto Reset when Compressor Discharge Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connector.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check sensor resistance. (See Note 3, page 7–2.)	100,000 Ohms @ 77°F (25°C) See Table 8–6 for complete resistance chart.)
	2	**Check Compressor Discharge Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP, see wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to the sensor.
126	**CHECK FUEL SENSOR CIRCUIT** • TRIGGER–ON: The fuel level sensor is configured as a 0-5VDC or 0.25-4.75VDC sensor and the reading (in the data list) is less than 2% for 30 seconds. • UNIT CONTROL: Engine Operation: Alarm Only. Standby Operation: This alarm does not activate in standby. • RESET CONDITION: Auto Reset when fuel level is sensed above 4% for 30 seconds or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Low Fuel Level**	
		Check fuel level in tank.	Add fuel as needed.
	2	**Check Sensor Fuse & Wiring**	
		Perform sensor check procedure, refer to Section 8.5.6	NOTE: If new sensor is not available, the sensor may be configured OFF temporarily. Refer to Section 5.2.1 - Configurations.)

Alarm NO.	Steps	Alarm/Cause	Corrective Action
127	**CHECK SUCTION TEMP SENSOR**		
	• TRIGGER–ON: Compressor Suction Temperature Sensor (CST) is not within the range of -53 to +158°F (-47 to +70° C.) • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connector	No damage to sensor No damage, moisture, or corrosion in connector
		b. Check sensor resistance (See Note 3, page 7–2.)	10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP, see wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.
128	**LOW/UNBALANCED A/C AMPS**		
	• TRIGGER–ON: The compressor is on and AC Current Sensor 1 or 2 is less than 5 amps for 10 seconds OR If the difference between AC Current 1 and AC Current 2 is greater than 10 amps for 10 seconds. • UNIT CONTROL: Engine and Standby Operation: alarm only. • RESET CONDITION: Change unit to Standby Operation when AC Current Sensor 1 and 2 is greater than 7 amps for 5 minutes AND difference between AC Current 1 and AC Current 2 is less than 7 amps for 5 minutes OR alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Perform Pretrip Check**	
		Clear Active Alarm list, then run Pretrip & check for any new alarms.	Any active alarms must be corrected and cleared before proceeding.
	2	**Check Current Draw**	
		a. Use a clamp around A/C ammeter to check amps at power wires.	Must be ±1.0 Amp of reading in Data List.
		b. Check A/C amps with compressor running.	Must be greater than 5 Amps.
		c. Compare A/C Amp readings between L1-L2-L3.	Maximum allowable difference is 10 Amps.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
129	**CHECK ENG COOLANT SENSOR** • TRIGGER–ON: Engine Coolant Temperature Sensor (ENCT) is not within the range of -58 to +266°F (-50 to +130°C). • UNIT CONTROL: Engine Operation: Alarm Only. Standby Operation: This alarm does not activate in standby. • RESET CONDITION: Auto Reset or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connector.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check sensor resistance. (See Note 3, page 7–2.)	10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP, see wiring schematic Section 10).	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
130	**CHECK ENGINE RPM SENSOR**		
	• TRIGGER–ON: When in Engine Operation only. If ambient temperature is above 32°F (0°C), and this is the second or third start attempt, and the engine oil pressure switch is closed (oil pressure good), and engine RPM is sensed at less than 1000; **OR**, if ambient is below 32°F (0°C) and the DC amp draw is more than 2 amps, and this is the second or third start attempt, and engine RPM is sensed at less than 1000. • UNIT CONTROL: Alarm Only and engine will be considered running. • RESET CONDITION: Auto Reset in Auto Start when engine speed is greater than 1,000 RPM or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Alarm List**	
		Check for Alarm 41.	When alarms 41 and 130 occur at the same time, generally, the engine has run out or is running out of fuel. This causes the engine to surge. Check fuel in tank and add fuel as necessary. Check fuel lines between the fuel tank and the fuel pump inlet to endure air is not being drawn in.
	2	**Check Engine Speed Sensor (ENSSN)**	
		a. Inspect circuit from ENSCU terminal 3 to microprocessor connection 2MP18 & connector.	No damage to sensor or wiring. No damage, moisture, or corrosion in connector.
		b. Compare actual engine speed with that shown on the display using hand held tachometer.	Must be ± 20 RPM. Must be a steady reading.
		c. Check for 12 VDC between ENSSN 12V terminal & ENSSN ground.	Must be 12 VDC.
		d. Check for 12 VDC at ENSSU terminal 25 to ground	Must be 12 VDC.
	3	**Check Circuits With Test Sensor**	
		Substitute known good sensor and check Unit Data reading (Refer to Section 3.13).	Must be within ± 20 RPM of reading on tachometer.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
131	**CHECK EVAP TEMP SENSOR** • TRIGGER–ON: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of -53 to +158°F (-47 to +70°C.) • UNIT CONTROL: Engine and standby: alarm only and superheat for EVXV will be calculated using SAT. • RESET CONDITION: Auto Reset when Evap Temp Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Sensor**	
		a. Inspect sensor & connector.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check Evap Temp Sensor resistance. (See Note 3, page 7–2.)	10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Sensor Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP & DP16, see wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
133	**CHECK REMOTE TEMP SENSOR 1** **134 CHECK REMOTE TEMP SENSOR 2** **135 CHECK REMOTE TEMP SENSOR 3** • TRIGGER–ON: Remote Temperature Sensor (REMSN1, REMSN2 or REMSN3) is not within the range of -53 to +158°F (-47 to +70°C.) • UNIT CONTROL: Engine and Standby Operation: Alarm only. • RESET CONDITION: Auto Reset when Remote Temperature Sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
		IF A SENSOR IS INSTALLED	
	1	**Check Sensor**	
		a. Inspect sensor & connector.	No damage to sensor. No damage, moisture, or corrosion in connector.
		b. Check Remote Temp Sensor resistance (See Note 3, page 7–2.)	10,000 Ohms @ 77°F (25°C.) See Table 8–5 for complete table of temperatures and resistance values.
	2	**Check Wiring**	
		a. Inspect harness & control box connector pins & terminals. (1MP & REM,SN see wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		b. Power up the microprocessor (see Note 2 page 7–2). Disconnect sensor from harness. Check for 2.5 VDC at harness plug between pins.	Voltage should be 2.5 VDC volts at harness plug between pins. This verifies microprocessor output and wiring connections to sensor.
		IF A SENSOR IS NOT INSTALLED	
		Locate and inspect 10 position connector for optional sensors and switches (REMSN, see wiring schematic Section 10).	Connector must have cap on, No corrosion or moisture inside connector. If there is a problem with the connector and there are no remote sensors or switches in the unit, the connector may be removed and each individual wire separated from the others, terminated and insulated with heat shrink.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.9 PRETRIP ALARMS			
P141 PRETRIP STOPPED BY USER • TRIGGER–ON: Pretrip cycle was stopped by user before the Pretrip cycle ended automatically. • UNIT CONTROL: Engine and Standby Operation: Alarm Only. • RESET CONDITION: Alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check For Any Pretrip Alarms**	
		Scroll the alarm list for any Active Pretrip alarms.	Alarm conditions must be corrected and the alarm cleared to continue.
	2	**Rerun Pretrip Check (If Desired)**	
		a. Clear Active Alarm List, then run Pretrip & check for any new alarms.	Unit is in Pretrip. Check for any new alarms.
		b. Allow to terminate automatically.	Pretrip cycle operates normally.
P144 CHECK UL1 CIRCUIT • TRIGGER–ON: Normal Amps for the Front Unloader (UL1) Circuit is 0.75 to 2.0 Amps. The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in test 2 and display “PRETRIP FAIL AND COMPLETED”. • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check UL1 circuit - refer to procedure for alarm 85	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P145 CHECK SPEED SOL CIRCUIT • TRIGGER–ON: Normal Amps for the Speed Solenoid Circuit is 0 to 1.0 Amps. The circuit tests outsidethis range. • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again.			
	1	**Check For Bad F2 Or F3 Fuse Alarm**	
		Check for Alarm 71.	Alarm conditions must be corrected and the alarm cleared to continue.
	2	**Check Speed Circuit To ENSCU And FSA**	
		a. Check voltage to ENSCU and amp draw of engine speed control circuit (ENSCU) pin 16 and MPQC3 on the microprocessor.	Use Component Test mode to energize the Speed Relay. (Section 5.2.2) Refer to Section 2.12 for amp values. View current draw in the Unit Data. (Refer to Section 3.13). Check voltage at ENSCU16 and ground. Must be 11 VDC or higher.
		b. Check operation of Speed Relay LED	LED 27 must be ON when the Speed Relay is ON in component Test Mode.
	3	**Check Engine Speed Control Unit (ENSCU)**	
		a.Check resistance of FSA	Refer to Section 2.12. With FSA unplugged, ohm spec is 3 to 4 ohms, ± 10%.
		b. Inspect ENSCU and wiring	No physical damage to harness. No damage, moisture, or corrosion in connectors. No damage to ENSCU
	4	**Check ENSCU Circuit Wiring**	
		Inspect harness & control box connector pins & terminals (See wiring schematic)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P151 CHECK GLOW PLUG CIRCUIT (This applies to the Intake Air Heater) • TRIGGER–ON: Normal Amps for the Intake Air Heater Circuit is 23 to 75 Amps after 15 seconds. The circuit tests outside this range. • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again.			
		Check glow plug circuit - refer to procedure for alarm 40	
P152 CHECK FUEL SOLENOID CIRC • TRIGGER–ON: Normal Amps for the Fuel Solenoid Hold Circuit is 0.2 to 4.5 Amps (including possible electric fuel pump). The circuit tests outside this range. • UNIT CONTROL: Alarm Only • RESET CONDITION: Auto Reset if Pretrip mode is started again, or Alarm may be manually reset via Keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check for bad F2 or F3 fuse alarm**	
		Check for alarm 71	Alarm conditions must be corrected and the alarm cleared to continue.
	2	**Check fuel and speed actuator (FSA)**	
		a. Check resistance of FSA	Refer to Section 2.12.
		b. Check amp draw between MPQC4 & terminal 13 of the ENSCU.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for amp values.
	3	**Check FSA & circuits**	
		a. Inspect FSA and wiring	No physical damage to harness. No damaged or corroded pins No damage to component
		b. Check operation of Run Relay	With microprocessor powered, see Note 2. LED 28 must be ON.
		c. Check voltage to FSA	With microprocessor powered, see Note 2. OR component test mode, 12 VDC between engine speed control unit (ENSCU) pins 13 and 19. With Main Power switch not in the OFF position, 12 VDC between ENSCU pins 24 and 19.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P153 CHECK RETURN AIR SENSOR • TRIGGER–ON: Return Air Temperature Sensor (1RAT) is not within the range of -53 to +158°F (-47 to +70°C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check Sensor - refer to procedure for alarm 122	
P154 CHECK SUPPLY AIR SENSOR • TRIGGER–ON: Supply Air Temperature Sensor (1SAT) is not within the range of -53 to +158°F (-47 to +70°C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check Sensor - refer to procedure for alarm 123	
P155 CHECK COOLANT TEMP SENSOR • TRIGGER–ON: Engine Coolant Temperature Sensor (ENCT) is not within the range of -58 to +266°F (-50 to +130°C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check Sensor - refer to procedure for alarm 129	
P156 CHECK BATTERY VOLTS • TRIGGER–ON: Battery voltage is less than 11 VDC or greater than 17 VDC. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
		Refer to procedure for alarm 15 for high voltage condition or procedure for alarm 16 for low voltage condition	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P157 CHECK BATTERY CURRENT • TRIGGER–ON: With all circuits off, current flow of more than 1.5 amps is detected in the 12 VDC electrical circuits. **NOTE**: If this alarm occurs, Pretrip Test #2 will not be performed. You will need to run pretrip again. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check No Load Current Draw**	
		a. Energize circuit (refer to Note 2 page 7–2). Observe current draw on microprocessor display.	Reading is less than 1.5 Amps.
		b. Disconnect F5 wire and remove from inside DC current sensor (see Figure 2–9, page 2–12). Reconnect at F5 and power the microprocessor by toggling the Main Power switch out of the OFF position.	Without wire in sensor, reading should be 0 +/- 1 amp. NOTE: Ensure wire is rerouted through sensor prior to returning unit to service.
	2	**Check Individual Circuits**	
		Isolate individual circuits and test amp draw.	Must be in range. (Refer to Section 2.12 for correct electrical values.)
	3	**Check for parasitic loads.**	
		Check for electrical loads that are drawing current with all circuits OFF	Check for non-factory installed devices such as lift gates, inside lights, satellite systems, etc. These devices must be wired so as to not draw current during Pretrip testing.
P158 CHECK AMBIENT AIR SENSOR • TRIGGER–ON: Ambient Air Temperature Sensor (AAT) is not within the range of -53 to +158°F (-47 to +70°C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check Sensor - refer to procedure for alarm 121	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P159 CHECK DEFROST TERM 1 SENSOR • TRIGGER–ON: Defrost Termination Temperature Sensor (1DTT) is not within the range of -53 to +158°F (-47 to +70°0 C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check Sensor - refer to procedure for alarm 124	
P160 CHECK DISCHARGE TEMP SENSOR • TRIGGER–ON: Compressor Discharge Temperature Sensor (CDT) is not within the range of -40 to +392°F (-40 to +200°C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again.			
		Check Sensor - refer to procedure for alarm 125	
P161 CHECK SUCTION TEMP SENSOR (CST) • TRIGGER–ON: Suction Temp Sensor (CST) is not within the range of -53° to +158°F (-47° to +70°C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset when suction temperature sensor is in range or, alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check Sensor - refer to procedure for alarm 127	
P164 CHECK UL2 CIRCUIT • TRIGGER–ON: Normal Amps for the Rear Unloader (UL2) Circuit is 0.75 to 2.0 Amps. The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in test 2 and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check UL2 circuit - refer to procedure for alarm 86	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P174 CHECK LOW SPEED RPM • TRIGGER–ON in Test #5: With Speed Relay turned off, engine speed is NOT between 1250 and 1450 rpm. • TRIGGER–ON in Test #7: 15 seconds after the High Speed Pretrip Test #6, engine speed has NOT dropped back to the low speed range (within 15 seconds) as shown above. Note: This test will be skipped if the RPM sensor alarm (A130) is active. • UNIT CONTROL: Engine Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". Standby Operation: This test is not made. • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Model Number**	
		Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data.	Enter the correct number in Configurations. Refer to Section 5.2.1
	2	**Check the fuel/speed actuator**	
		Check FSA plunger.	Must move in and out freely.
	3	**Verify low speed operation (See Note 5 page 7–2)**	
		a. Set Functional Parameter "LOW SPEED START" for a high number (30 to 90) then start the unit. **Set Functional Parameter back to original setting after completing repairs.**	LED 27 must be OFF.
		b. Check operation of Speed Relay LED.	LED 27 must be OFF.
		c. Check voltage to FSA.	Must be 0 VDC.
		d. Check for 12 VDC on engine speed control unit (ENSCU) pin 22.	Must be 12 VDC.
	4	**Check for proper voltage to the Engine Speed Control Unit (ENSCU) Pin 16 Based On Requested Speed From The Microprocessor**	
		Check voltage at pin 16 with unit running.	Must be 0 VDC.
	5	**Check engine RPM**	
		a. Check actual engine RPM using hand held tachometer.	Check Speed Control System, refer to Section 9.5
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM.
	6	**Check engine intake air system**	
		a. Check air cleaner indicator.	Flag must not be visible.
		b. Inspect air intake system.	Hoses & tubes in good condition. No kinks or restrictions.
	7	**Check engine exhaust system**	
		Inspect the exhaust system.	Must be clear and unobstructed.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P175 CHECK HIGH SPEED RPM • TRIGGER–ON: With Speed Relay energized (voltage at the Engine Speed Control Unit for high speed operation), engine RPM is NOT between 1700 and 1900. • UNIT CONTROL: Engine Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". Standby Operation: This test is not made. • RESET CONDITION: Auto Reset if Pretrip is started again, or Alarm may be manually reset via Keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Model Number**	
		Verify that the model number on the nameplate matches the model number shown in the microprocessor Unit Data.	Enter the correct number in the data list. (Refer to Section 3.13.)
	2	**Check the fuel/speed actuator**	
		Check FSA plunger.	Must move in and out freely.
	3	**Force high speed operation (See Note 5 page 7–2)**	
		a. Set Functional Parameter "LOW SPEED START" to zero and adjust set point at least 10°F (5.6°C) above or below refrigerated compartment temperature then start the unit. **Set Functional Parameter back to original setting after completing repairs.**	LED 27 must be ON.
		b. Check operation of Speed Relay.	LED 27 must be ON.
		c. Check voltage to FSA.	Must be 12-14 VDC.
		d. Check resistance of FSA.	Refer to Section 2.12 for correct electrical values.
		e. Check amp draw of FSA.	Use Component Test Mode to energize the Speed Relay circuit. (Section 5.2.2.) Refer to Section 2.12 for correct electrical values. View current draw in the Unit Data. (Refer to Section 3.13.
		f. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	4	**Check for proper voltage to the Engine Speed Control Unit (ENSCU) Pin 16 Based On Requested Speed From The Microprocessor**	
		Check 12 VDC at pin 16 with unit running.	Must be 12 VDC when the microprocessor is calling for high speed.
	5	**Check engine RPM**	
		a. Check actual engine RPM using hand held tachometer.	Check Speed Control System, refer to Section 9.5
		b. Compare actual RPM with those shown on display.	Both readings within ± 50 RPM.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P175	**CHECK HIGH SPEED RPM - Continued**		
	6	**Check engine air-intake system**	
		a. Check air cleaner indicator.	Flag must not be visible.
		b. Inspect air intake system.	Hoses & tubes in good condition. No kinks or restrictions.
	7	**Check engine exhaust system**	
		Inspect the exhaust system.	Must be clear and unobstructed.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P177 CHECK EVAP SUPERHEAT • TRIGGER–ON: With the unit running in Test 12, after the microprocessor closes the EVXV to 0%, evaporator pressure fails to drop by 20 psig (1.36 bar) or fails to go below 0 psig / bar **OR** the EVXV appears not to be opening to the full capacity position. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Refrigerant Level**	
		Check refrigerant charge.	Refer to Section 8.6.2.
	2	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.	Suction and Evaporator Outlet pressures must be above 3 psig (0.2 bar.) Suction, Evaporator Outlet & Discharge Pressures must have the same reading on gauges & on microprocessor display. NOTE: Microprocessor Suction (CSP) and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test.
	3	**Check EVXV**	
		a. Visually inspect EVXV for damage.	Check to see if coil is seated on valve properly.
		b. Inspect EVXV coil and wire connections.	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		c. Check coil resistance.	See Section 8.8.6.
		d. Check EVXV operation.	See Section 8.8.6.
		e. Check basic refrigeration system.	Pressures normal. Compressor operation normal.
		f. Check the EVXV electrical system.	Check for good continuity in all circuits from micro to EVXV.
		g. Inspect component and wire connections.	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		h. Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P178 CHECK UL1 • TRIGGER–ON: The pressure differential between suction and discharge pressures did not change as expected when the Front Unloader (UL1) was de-energized / loaded (discharge pressure should rise and suction pressure should drop) or when it was energized / unloaded (discharge pressure should drop and suction pressure should rise. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in test 13 and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset viakey-pad or by turning the unit off then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check wiring to DPT & SPT**	
		a. Verify that correct wires are connected to each transducer.	Plugs to transducers are the same. The correct wire plug must be connected to the proper transducer.
		b. Verify that correct transducer is being used in each position.	Mechanical connections to transducers are the same. The Discharge Transducer should have a RED marking dot on it. The Suction Transducer should have a BLUE marking dot on it.
	2	**Check for Check UL1 Alarm**	
		Check for alarm 85 or P144.	Alarm conditions must be corrected and the alarm cleared to continue.
	3	**Confirm Compressor Suction Pressure Transducer Is Working**	
		a. Check transducer operation	Refer to Section 8.8.8
		b. Check Schrader valve fitting under each transducer	Must not be physically damaged, depressor must fully open valve to allow pressure to transducer
		a. Verify the correct Transducer is in place.	Verify by part number or colored dot that the correct Transducer is installed for the SPT.
	4	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.	Suction and Evaporator Outlet pressures must be above 3 psig (0.2 bar.) Suction, Evaporator Outlet & Discharge Pressures must have the same reading on gauges & on microprocessor display. **NOTE: Microprocessor Suction (CSP and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test.**
	5	**Check Front Unloader (UL1) Operation - Unit must be running (See Note 5 page 7–2)**	
		Check operation of Front Unloader (UL1).	See Section 8.7.6 Unloader must load and unload properly.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P180 CHECK SUCTION MOD VALVE • TRIGGER–ON: With the unit running in Pretrip Test #11, after the microprocessor attempts to close CSMV, the suction pressure fails to drop below 4in. Hg (-0.14 bar.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL IN TEST 11". • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Software Revision Level**	
		Upgrade software.	Install (or have Carrier Transicold dealer install) latest revision.
	2	**Check wiring to DPT & SPT**	
		a. Verify that correct wires are connected to each transducer.	Plugs to transducers are the same. The correct wire plug must be connected to the proper transducer.
		b. Verify that correct transducer is being used in each position.	Mechanical connections to transducers are the same. The Discharge Transducer should have a RED marking dot on it. The Suction Transducer should have a BLUE marking dot on it.
	3	**Check Compressor Operation**	
		Check compressor operation.	Refer to Section 8.7.1. If compressor does not pass all tests, repair or replace compressor.
	4	**Check Suction Modulating Valve**	
		a. Visually inspect CSMV.	No damage to valve.
		b. Inspect CSMV coil and wire connections. Refer to Section 8.8.5.	No damage to coil. No damage, moisture, or corrosion in connector.
		c. Check CSMV operation. Refer to Section 8.8.5.	Must perform correctly.
		d. Check wires from CSMV to microprocessor.	No visual damage to wires Continuity test verifies that each wire is good.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P186 CHECK EVAP OUTLET TEMP • TRIGGER–ON: Evaporator Outlet Temperature Sensor (EVOT) is not within the range of -53 to +158°F (-47 to +70°C.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
		Check Sensor - refer to procedure for alarm 131	
P187 CHECK HEATER 1 CIRCUIT This device is checked twice in Pretrip - once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2 (unit not running): Normal draw for the 1HTCON1 relay coil is 0.05 to 1.0 Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8 (unit running): Normal draw for the 1HTCON1 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again or alarm may be manually reset via keypad or by turning the unit off then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list.	Make a note of all alarms.
		b. Clear active alarm list.	
		c. Restart and monitor Pretrip.	Stop Pretrip during Test #3 by holding = Key for 6 seconds.
		d. Review active alarm list for Alarm 187.	If alarm is present, follow steps 2 thru 5 If alarm is not present, follow steps 6 thru 9.
12 VDC CIR-CUIT	2	**Check 1HTCON1**	
		a. Inspect heater contactor coil and wire connections.	No damage to coil. Wire connections to contactor coil are tight. No damaged or corroded wires to contactor coil.
		b. Check contactor coil resistance.	Refer to Section 2.12 for correct electrical values.
	3	**Check 1HTCON1 Amp Draw**	
		Check 1HTCON1 amp draw.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	4	**Check 1HTCON1 Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	5	**Check Evaporator High Temperature Switch (EVHTS)**	
		Inspect for open EVHTS per wiring schematic Section 10.	If open, replace switch as required.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P187 CHECK HEATER 1 CIRCUIT - Continued			
460 VAC CIR-CUIT	6	**Check Amp Draw of 1HTCON1 Heater Circuit**	
		a. With the unit running and calling for Heat, use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.11 for all three legs.
		b. Check fuses for heater elements.	F10, F11, and F12 must not be blown.
		c. Check voltage at 1HTCON1 contacts.	Must be within range shown in Section 2.11 for L1-L2, L1-L3, and L2-L3. Must be within range shown in Section 2.11 for T1-T2, T1-T3, and T2-T3.
	7	**Check Heater Elements**	
		a. Check heater elements with the unit Off.	No visual physical damage. Remove and replace if damaged.
		b. Check heater element resistance.	Check from “T” terminals on 1HTCON1 contactor. See section 2.11 for correct resistance.
	8	**Check Heater Element Connections**	
		a. Inspect high voltage heater connections at evaporator.	No corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.
		b. Disconnect heater element plug.	Heater resistance per Section 2.11. Remove and replace heaters if required.
		a. Inspect plugs, plug seal and connectors.	No corrosion, water damage or burning / discoloration. Remove and replace if required.
	9	**Verify Accuracy of AC Current Sensor**	
		Put microprocessor in PC Mode. Refer to section 5.3 page 5–3.	Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P188 CHECK HEATER 2 CIRCUIT This device is checked twice in Pretrip - once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2 (unit not running): Normal draw for the 1HTCON2 contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 8 (unit running): Normal draw for the 1HTCON2 heaters is 1.0 to 3.5 Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list.	Make a note of all alarms.
		b. Clear active alarm list.	
		c. Restart and monitor Pretrip.	Stop Pretrip during Test #3 by holding = Key for 6 seconds.
		d. Review active alarm list for Alarm 188.	If alarm is present, follow steps 2 thru 4 If alarm is not present, follow steps 5 thru 10.
12 VDC CIR-CUIT	2	**Check 1HTCON2**	
		a. Inspect heater contactor coil and wire connections.	No damage to coil. No damage, moisture, or corrosion in connections.
		b. Check contactor coil resistance.	Refer to Section 2.12.
	3	**Check 1HTCON2 Amp Draw**	
		Check 1HTCON2 amp draw.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	4	**Check 1HTCON2 Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
	5	**Check Evaporator High Temperature Switch (EVHTS)**	
		Inspect for open EVHTS per wiring schematic Section 10.	If open, replace switch as required.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P188	**CHECK HEATER 2 CIRCUIT - Continued**		
460 VAC CIR-CUIT	6	**Check Amp Draw of 1HTCON2 Heater Circuit**	
		a. With the unit running and calling for pull up in, use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.11 for all three legs.
		b. Check fuses for heater elements	F10, F11, and F12 must not be blown.
		c. Check voltage at 1HTCON2 contacts.	Must be within range shown in Section2.11for L1-L2, L1-L3, and L2-L3. Must be within range shown in Section 2.11 for T1-T2, T1-T3, and T2-T3.
	7	**Check Heater Elements**	
		a. Check heater elements with the unit Off.	No visual physical damage Remove and replace if damaged
		b. Check heater element resistance.	Check from “T” terminals on HTCON2 contactor. See section 2.11 for correct resistance.
	8	**Check Heater Element Connections**	
		Inspect high voltage heater connections at evaporator.	No corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.
	9	**Verify Accuracy of AC Current Sensor**	
		Put microprocessor in PC Mode. Refer to Section 5.3 page 5–3.	Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P189 CHECK EVAPORATOR FAN MOTOR This device is checked twice in Pretrip - once in Test 2 and again in Test 8. • TRIGGER–ON TEST 2 (unit not running): Normal draw for the 1EVCON contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range. • TRIGGER–ON TEST 9 (unit running): Normal draw for the Evaporator Fan motor is 0.7 to 3.5 Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Determine Which Test This Alarm Occurred In**	
		a. Review active alarm list.	Make a note of all alarms.
		b. Clear active alarm list.	
		c. Restart and monitor Pretrip.	Stop Pretrip during Test #3 by holding = Key for 6 seconds.
		d. Review active alarm list for Alarm 189.	If alarm is present, follow steps 2thru 4 If alarm is not present, follow Steps 5 thru 8
12 VDC CIR-CUIT	2	**Check 1EVCON**	
		a. Inspect Evaporator Fan Motor contactor coil and wire connections.	No damage to coil. No damage, moisture, or corrosion in connections.
		b. Check contactor coil resistance.	Refer to Section 2.12.
	3	**Check 1EVCON Amp Draw**	
		Check 1EVCON amp draw.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for correct electrical values. View current draw in Data List.
	4	**Check 1EVCON Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
		Additional steps on the next page.	

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P189 CHECK EVAPORATOR FAN MOTOR - Continued			
460 VAC CIR-CUIT	5	**Check Amp Draw of 1EVCON Evap Fan Motor Circuit**	
		a. With the unit running in either HEAT or COOL use a clamp on ammeter to check the current draw of all 3 legs.	Must be within range shown in Section 2.11 for all three legs.
		b. Check fuses for evaporator fan motor.	F26, F27, and F28 must not be blown.
		c. Check voltage at 1EVCON contacts.	Must be within range shown in Section 2.11 for L1-L2, L1-L3, and L2-L3. Must be within range shown in Section 2.11 for T1-T2, T1-T3, and T2-T3.
	6	**Check Evaporator Fan Motor**	
		a. With the unit off, visually check fan motor and blower wheel.	No visual physical damage. No blockage to blower wheels. Blower wheels spin freely. Remove and replace if required.
		b. With the unit off, check the resistance of the evaporator fan motor windings.	See Section 2.11 for correct resistance. Resistance (Ohms) must be in range. No continuity from any high voltage lead to ground.
	7	**Check Evaporator Fan Motor Connections**	
		Inspect high voltage fan motor connections at evaporator.	No corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.
	8	**Verify Accuracy of AC Current Sensor**	
		Put microprocessor in PC Mode. Refer to Section 5.3 page 5–3.	Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P190 CHECK CONDENSER FAN MOTOR • TRIGGER–ON Normal draw for the condenser fan motors is 0.8 to 3.5 Amps (460 VAC). The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
460 VAC CIR-CUIT	1	**Check Amp Draw of Condenser Fan Motor Circuit**	
		a. With the unit running use a clamp on ammeter to check the current draw at CDCON on all 3 legs.	Must be within range shown in Section 2.11 for all three legs. If higher than normal draw is read, the wiring for the motors must be separated, and each motor tested individually.
		b. Check fuses for condenser fan motors.	F26, F27, and F28 must not be blown.
		c. Check voltage at CDCON contacts.	Must be within range shown in Section 2.11 for L1-L2, L1-L3, and L2-L3. Must be within range shown in Section 2.11 for T1-T2, T1-T3, and T2-T3.
	2	**Check Condenser Fan Motors**	
		a. Check condenser fan motors.	No visual physical damage. No blockage due to debris. Remove and replace if required.
		b. With the unit off, visually check fan motors and fan blades.	No visual physical damage. No blockage to fan blades. Fan blades spin freely. Remove and replace if required.
		c. With the unit off, check the resistance of the condenser fan motor windings.	See Section 2.11 for correct resistance. Resistance (Ohms) must be in range. No continuity from any high voltage lead to ground.
	3	**Check Condenser Fan Motor Connections**	
		Inspect high voltage connections at the condenser fan motors.	No corrosion, water damage or burning / discoloration. Remove, repair, or replace if required.
	4	**Verify Accuracy of AC Current Sensor**	
		Put microprocessor in PC Mode. Refer to Section 5.3 page 5–3.	Must have 0 AC1 Amps and 0 AC2 Amps in Unit Data.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P191 CHECK UL2 • TRIGGER–ON: The pressure differential between suction and discharge pressures did not change as expected when the Rear Unloader (UL2) was de-energized / loaded (discharge pressure should rise and suction pressure should drop) or when it was energized / unloaded (discharge pressure should drop and suction pressure should rise. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail in test 13 and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) **.** Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check wiring to DPT & SPT**	
		a. Verify that correct wires are connected to each transducer	Plugs to transducers are the same. The correct wire plug must be connected to the proper transducer.
		b. Verify that correct transducer is being used in each position.	Mechanical connections to transducers are the same. The Discharge Transducer should have a RED marking dot on it. The Suction Transducer should have a BLUE marking dot on it.
	2	**Check for Check UL2 Alarm**	
		Check for alarm 86 or P164	Alarm conditions must be corrected and the alarm cleared to continue
	3	**Check System Pressures**	
		Install manifold gauge set and check and compare compressor discharge & suction pressures with those shown on the microprocessor display.	Suction and Evaporator Outlet pressures must be above 3 psig (0.2 bar.) Suction, Evaporator Outlet & Discharge Pressures must have the same reading on gauges & on microprocessor display. **NOTE: Microprocessor Suction (CSP and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test.**
	4	**Check Rear Unloader (UL2) Operation - Unit must be running. (See Note 5 page 7–2)**	
		Check operation of Rear Unloader (UL2)	See Section 8.7.6. Unloader must load and unload properly.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P206 CHECK CONDENSER FAN CIRCUIT • TRIGGER–ON : Normal draw for the CDCON contactor coil is 0.05 to 2.0 Amps (12 VDC). The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check CDCON**	
		a. Inspect CDCON contactor coil and wire connections.	No damage to coil. No damage, moisture, or corrosion in connections.
		b. Check contactor coil resistance.	Refer to Section 2.12.
	2	**Check CDCON Amp Draw**	
		Check CDCON contactor coil amp draw.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for amp values. View current draw in Data List.
	3	**Check CDCON Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.
P207 CHECK COMPRESSOR CONTACT CIRC • TRIGGER–ON: Normal draw for the CCONR and CCON relay coils is 0.0 to 1.0 Amps (12 VDC). The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset viakeypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check CCONR**	
		a. Inspect CCONR and CCON contactor coils and wire connections.	No damage to coil. No damage, moisture, or corrosion in connections.
		b. Check contactor coil resistance	Refer to Section 2.12.
	2	**Check CCONR Amp Draw**	
		a. Check CCONR and CCON contactor coil amp draw.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for correct electrical values. View current draw in Data List. FET 2 On.
		b. Listen for CCON to pull in.	If CCON contactor pulls in, CCONR and CCON are OK. If CCON contactor does not pull in, check for 12 VDC at CCON coil. 12 VDC indicates defective CCON coil. No voltage - check CCONR.
	3	**Check CCONR Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P208 CHECK GENERATOR CONT CIRC • TRIGGER–ON: Normal draw for the GENCONR and GENCON coils is 0.0 to 1.0 Amps (12 VDC). The circuit tests outside this range. • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check GENCONR**	
		a. Inspect GENCONR and GENCON contactor coils and wire connections.	No damage to coil. No damage, moisture, or corrosion in connections.
		b. Check contactor coil resistance.	Refer to Section 2.12.
	2	**Check GENCONR and GENCON Amp Draw**	
		a. Check GENCONR and GENCON contactor coils amp draw.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for amp values. View current draw in Data List. FET 3 On.
		b. Listen for GENCON to pull in.	If GENCON contactor pulls in, GENCONR and GENCON are OK. If GENCON contactor does not pull in, check for 12 VDC at GENCON coil. 12 VDC indicates defective GENCON coil. No voltage - check GENCONR.
	3	**Check GENCONR Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
P209 CHECK STANDBY CONT CIRCUIT • TRIGGER–ON: Normal amps for the PSCONR relay coil and PSCON or PSCON2 contactor coils 0.0 to 1.0 Amps (12 VDC). The circuit(s) test outside this range. (During this test either PSCON or PSCON2 will be tested depending on the phase reversal module.) • UNIT CONTROL: Engine and Standby Operation: Pretrip will fail and display "PRETRIP FAIL AND COMPLETED". • RESET CONDITION: Auto Reset if Pretrip is started again, or alarm may be manually reset via keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
NOTE: **IF PRETRIP IS DONE IN STANDBY MODE, THIS PRETRIP ALARM WILL GENERATE MANY OTHER PRETRIP ALARMS. THEREFORE, IT SHOULD BE ADDRESSED FIRST**			
	1	**Check PSCONR**	
		a. Inspect PSCONR, PSCON and PSCON2 contactor coils and wire connections.	No damage to coils. No damage, moisture, or corrosion in connections.
		b. Check contactor coil resistance.	Refer to Section 2.12 for resistance values
	2	**Check PSCONR, PSCON, and PSCON2 Amp Draw**	
		a. Check PSCONR, PSCON and PSCON2 contactor coils amp draw.	Use Component Test Mode (Section 5.2.2) to test. Refer to Section 2.12 for amp values. View current draw in Data List. FET 19 On.
		b. Listen for PSCON or PSCON2 to pull in.	If PSCON or PSCON2 contactor pulls in, PSCONR and PSCON or PSCON2 are OK. If PSCON or PSCON2 contactor does not pull in, check for 12 VDC at Phase Reversal Module (PRM) "N" terminal. 12 VDC indicates defective PSCON or PSCON2 coil. No voltage - check PSCONR and PRM.
	3	**Check PSCONR, PSCON, PSCON2 and PRM Wiring**	
		Inspect harness & control box connector pins & terminals. (See wiring schematic Section 10.)	No physical damage to harness. No damage, moisture, or corrosion in connectors.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.10 MAINTENANCE ALARMS			
223 ENGINE MAINTENANCE DUE • TRIGGER–ON: The Engine Maintenance Hour Meter time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.			
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance.	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset Engine Maintenance Hour Meter**	
		a. Check that the Engine Maintenance Hour Meter interval is set for your requirements.	Reset configured Interval if required.
		b. Reset Engine Maintenance Hour Meter for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.
224 STANDBY MAINTENANCE DUE • TRIGGER–ON: The Standby Hour Meter time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.			
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance.	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset Standby Hour Meter**	
		a. Check that the Standby Maintenance Hour Meter interval is set for your requirements.	Reset configured Interval if required.
		b. Reset Standby Maintenance Hour Meter for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
225	**GENERAL MAINTENANCE DUE** • TRIGGER–ON: The General Maintenance Hour Meter time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance.	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset General Maintenance Hour Meter**	
		a. Check that the General Maintenance Hour Meter interval is set for your requirements.	Reset configured Interval if required.
		b. Reset General Maintenance Hour Meter for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.
226	**SERVICE SOON-PM #1 DUE** • TRIGGER–ON: The Maintenance Hour Meter #1 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance.	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset Maintenance Hour Meter #1**	
		a. Check that Maintenance Hour Meter #1 interval is set for your requirements.	Reset configured Interval if required.
		b. Reset Maintenance Hour Meter #1 for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
227	**SERVICE SOON-PM #2 DUE** • TRIGGER–ON: The Maintenance Hour Meter #2 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance.	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset Maintenance Hour Meter #2**	
		a. Check that Maintenance Hour Meter #2 interval is set for your requirements.	Reset configured Interval if required.
		b. Reset Maintenance Hour Meter #2 for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.
228	**SERVICE SOON-PM #3 DUE** • TRIGGER–ON: The Maintenance Hour Meter #3 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance.	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset Maintenance Hour Meter #3**	
		a. Check that Maintenance Hour Meter #3 interval is set for your requirements.	Reset configured Interval if required.
		b. Reset Maintenance Hour Meter #3 for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
229	**SERVICE SOON-PM #4 DUE** • TRIGGER–ON: The Maintenance Hour Meter #4 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset Maintenance Hour Meter #4**	
		a. Check that Maintenance Hour Meter #4 interval is set for your requirements.	Reset configured Interval if required.
		b. Reset Maintenance Hour Meter #4 for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.
230	**SERVICE SOON-PM #5 DUE** • TRIGGER–ON: The Maintenance Hour Meter #5 time has expired. • UNIT CONTROL: Alarm Only. Alarm Light will NOT be turned on. • RESET CONDITION: Alarm may be manually reset via keypad.		
	1	**Check Unit Maintenance Records**	
		Schedule unit into service facility for maintenance.	Must be done soon!
	2	**Perform Maintenance**	
		Perform appropriate engine & unit maintenance.	Follow instructions on proper maintenance form.
	3	**Reset Maintenance Hour Meter #5**	
		a. Check that Maintenance Hour Meter #5 interval is set for your requirements.	Reset configured Interval if required.
		b. Reset Maintenance Hour Meter #5 for the next service interval.	Hour Meter reset is a Functional Parameter. Follow maintenance interval recommendations in Section 8.2.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
7.11 MICROPROCESSOR ALARMS			
232 SETPOINT ERROR • TRIGGER–ON: There is an error in the set point that is stored in the microprocessor memory. • UNIT CONTROL: Unit Shutdown & Alarm. • RESET CONDITION: Auto Reset when a valid set point is entered, or alarm may be manually reset by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Set Point**	
		a. Check set point setting.	Must be between -22 and +89.6° F (-30° and +32°C)
		b. Enter new set point.	
	2	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	The microprocessor powers up OK and the latest set point appears in the display.
		b. Valid set point can not be entered and alarm 232 remains active.	Download and replace microprocessor. Refer to Section 5.7.
233 MODEL # ERROR • TRIGGER–ON: There is an error in the Model Number that is stored in the microprocessor memory • UNIT CONTROL: Unit Shutdown & Alarm • RESET CONDITION: Auto Reset only when a valid Model number is entered.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Model Number**	
		a. Check Model Number in microprocessor. b. Enter correct Model Number.	Check Model Number on Nameplate. Select the correct model number in the “MODEL NUMBER” Configuration. If correct model number is not found, Install (or have Carrier Transicold dealer install) latest software revision.
	2	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	Microprocessor powers up OK.
		b. Check for valid Model number in Data List.	Valid number is present. Alarm is cleared.
		c. Valid model number can not be entered and alarm remains active.	Download and replace microprocessor. Refer to Section 5.7.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
237	**FUNCTION PARAMETERS ERROR** • TRIGGER–ON: There is an error in one or more of the Functional Parameters that are stored in the microprocessor memory. • UNIT CONTROL: Incorrect Functional Parameter(s) will be automatically set for default value. • RESET CONDITION: Auto Reset when valid Functional Parameters are entered, or alarm may be manually reset by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Functional Parameters**	
		Check Functional Parameters.	All must be set for selectable values.
	2	**Check Software Version**	
		Check microprocessor Software version.	Upgrade to the latest version of software. Newer versions may contain functional parameters that were not present in older versions of microprocessor software. Refer to Section 5.4.2.
	3	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	Microprocessor powers up OK.
		b. Check for valid Functional Parameters in Functional Parameters List.	Valid number is set for all parameters. Alarm is cleared.
		c. Valid Functional Parameter(s) can not be entered and alarm remains active.	Download and replace microprocessor. Refer to Section 5.7.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
238	**CONFIGURATIONS 1 ERROR** • TRIGGER–ON: There is an error in the Configuration settings that are stored in the microprocessor memory. • UNIT CONTROL: Incorrect Configuration(s) will be automatically set for default value. • RESET CONDITION: Auto Reset when valid Configuration(s) are entered, or alarm may be manually reset by turning the unit off, then back on again		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Configurations**	
		Check Configurations.	All must be set for selectable values.
	2	**Check Software Version**	
		Check microprocessor software version.	Upgrade to the latest version of software. Newer versions of ReeferManager may contain configurations that were not present in older versions of microprocessor software.
	3	**Reconfigure Microprocessor**	
		Send settings to microprocessor.	Using the latest version of ReeferManager and a Configuration PC Card, write the desired configuration file to the PC Card, then load the file into the microprocessor. Allow the microprocessor to reboot itself.
	4	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	Microprocessor powers up OK.
		b. Check for valid Configuration settings in Configuration List.	Values are set correctly for all parameters. Alarm is cleared.
		c Disconnect positive battery cable from the battery, wait 30 seconds, then reconnect and place the Main Power switch in the desired position.	Microprocessor powers up OK.
		d Check for valid Configuration settings in Configuration List.	Values are set correctly for all parameters. Alarm is cleared.
		c. Valid Configurations can not be entered and alarm remains active.	Download and replace microprocessor. Refer to Section 5.7.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
242	**DIS PRESS CALIBRATE ERROR** • TRIGGER–ON: There is an error in the Compressor Discharge Pressure Sensor Calibration value stored in memory. • UNIT CONTROL: Alarm Only. • RESET CONDITION: Auto Reset when the Discharge Pressure Sensor is calibrated successfully, or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Discharge Pressure Reading**	
		Check Discharge Pressure Reading.	Must read valid data.
	2	**Calibrate Discharge Pressure Sensor**	
		a. Calibrate Discharge Pressure Sensor.	Calibration successful.
		b. Discharge Pressure Sensor can not be successfully calibrated and alarm remains active.	Download and replace microprocessor. Refer to Section 5.7.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
243	**SUCTION/EVAP CALIBRATE ERROR** • TRIGGER–ON: There is an error in either or both of the Suction Pressure (CSP) or Evaporator Pressure (EVOP) Sensor Calibration values stored in the microprocessor memory. Note that neither of these transducers can be calibrated manually. This is an error in the microprocessor. • UNIT CONTROL: Alarm only. • RESET CONDITION: Auto Reset when both Suction and Evaporator Pressure transducers are reading correctly or alarm may be manually reset via keypad or by turning the unit off, then back on again.		
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Suction Pressure (CSP) and Evaporator Pressure (EVOP) Readings**	
		a. Check Suction and Evaporator Pressure Readings in the Unit Data.	Must read valid data.
		b. Install manifold gauge set and check and compare compressor suction & evaporator pressures with those shown on the microprocessor display.	Suction and Evaporator Outlet Pressures must have the same reading on gauges & on microprocessor display. **NOTE: Microprocessor Suction (CSP) and Evaporator (EVOP) pressure readings have a maximum value of 100 psig (7.5 bar.) The actual pressure must be lower than 100 psig in order to perform this test.**
	2	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	Microprocessor powers up OK
		b. Wait 2-3 minutes, then check to see if A-243 becomes active again.	Suction and Evaporator pressure values are reading OK when compared to test gauges. Alarm is cleared.
		c. Disconnect positive battery cable from the battery, wait 30 seconds, then reconnect and place the Main Power switch in the desired position.	Microprocessor powers up OK
		d. Wait 2-3 minutes, then check to see if A-243 becomes active again.	Suction and Evaporator pressure values are reading OK when compared to test gauges. Alarm is cleared.
		e. Valid readings are not appearing for either or both the Suction and Evaporator Pressures in the Unit Data.	Download and replace microprocessor. Refer to Section 5.7.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
245 CANNOT SAVE SETTING • TRIGGER–ON: There is an error in sending and saving new settings in the Microprocessor memory. • UNIT CONTROL: Alarm only. • RESET CONDITION: Alarm may be manually reset via Keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Microprocessor Software Revision**	
		Check microprocessor software revision.	Will be a 6 digit number, upgrade if required. Refer to Section 5.4.2.
	2	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	
		b. Check Active Alarm List.	Alarm is cleared - microprocessor is OK.
		c. Alarm 245 remains active.	Unit will operate, but changes to the settings will not be retained in the microprocessor memory. Download and replace microprocessor. Refer to Section 5.7.
246 EEPROM WRITE FAILURE • TRIGGER–ON: here is an error in the ability to write information to be stored in the memory. • UNIT CONTROL: Alarm only • RESET CONDITION: Alarm may be manually reset via Keypad or by turning the unit off, then back on again.			
NOTE: Follow the steps below until a problem is found. Once a repair or correction has been made, the active alarm should clear itself (see reset condition above). Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Microprocessor**	
		a. Check set point setting.	Must be between -22 and +89.6°F (-30 and +32°C.)
		b.Enter new set point.	Must be between -22 and +89.6°F (-30 and +32°C.)
	2	**Reset Microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	Microprocessor powers up OK.
		b. Alarm 246 remains active.	Download and replace microprocessor. Download and replace microprocessor. Refer to Section 5.7.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
248	**CONFIGURATION MODE / HP2 ERROR** • TRIGGER–ON: EEPROM configuration is out of range. • UNIT CONTROL: Shutdown and alarm. • RESET CONDITION: Auto Reset only when valid info is available for the microprocessor are entered.		
Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check microprocessor**	
		a. Check set point setting.	Must be between -22 and +89.6°F (-30 and +32°C.)
		b. Enter new set point.	Must be between -22 and +89.6°F (-30 and +32°C.)
		c. Check Functional Parameters.	All settings must be valid.
	2	**Check Software Revision**	
		a. Check microprocessor software revision.	Upgrade to the latest revision of software. The latest revision may contain configurations that were not present in older revisions.
		b. Check Functional Parameters	All settings must be valid. Send desired settings to microprocessor using the latest version of ReeferManager or a PC Card (Do NOT use the keypad.)
		c. Check Configurations	All settings must be valid. Send desired settings to microprocessor using the latest version of ReeferManager or a PC Card (Do NOT use the keypad.)
	3	**Reset microprocessor**	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	Microprocessor powers up OK.
		b. Alarm 248 remains active.	Download and replace microprocessor. Refer to Section 5.7.

Alarm NO.	Steps	Alarm/Cause	Corrective Action
249	**MICROPROCESSOR ERROR** • TRIGGER–ON: Microprocessor Input Conversion Error. • UNIT CONTROL: Shutdown and alarm. • RESET CONDITION: Auto Reset when input conversions are valid, or Alarm may be manually reset by turning the unit off, then back on again.		
Follow the steps below until a problem is found. Once a repair or correction has been made, clear the alarm(s). (See Note 1 page 7–2.) Operate the unit through the appropriate modes to see if any active alarm occurs. Continue with the steps below as necessary.			
	1	**Check Software Revision**	
		Check microprocessor software revision.	Upgrade to the latest revision of software.
	2	**Check Microprocessor**	
		a. Check Temperature Sensor Data	Must be valid reading for RAT, SAT, AAT, etc.
		b. Check for any Active Sensor Alarms	Must all be cleared.
	3	**Check Microprocessor & Unit Wiring**	
		Check Wiring to Micro and at input devices to the micro.	Must not be miss-wired to allow 12 VDC on any of the sensor input circuits.
	4	**Reset Microprocesso**r	
		a. Place the Main Power switch in the OFF position for 30 seconds, then back to the desired position.	Microprocessor powers up OK
		b. Alarm 249 remains active.	Download (if possible) and replace microprocessor. Refer to Section 5.7.

SECTION 8 – SERVICE

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SECTION 8

SERVICE

⚠ WARNING

Advance microprocessor equipped units may start automatically at any time the Main Power switch is not in the OFF position. Also, the unit may be fitted with two way communication equipment that will allow starting of the unit from a remote location even though the switch is in the OFF position.

⚠ WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the Main Power Switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.

⚠ WARNING

Disconnect batteries before doing any electrical welding on unit or chassis to which unit is attached (trailer, container, rail car, metal building, etc).

⚠ CAUTION

Unit uses R404A and POE oil. The use of inert gas brazing procedures is mandatory for all Carrier Transicold refrigeration units; otherwise compressor failure will occur. For more information Refer to Technical Procedure 98-50553-00 Inert Gas Brazing

8.1 SECTION LAYOUT

Service procedures are presented herein under the following major sections:

- Scheduled Maintenance - Section 8.2
- Pretrip Inspection - Section 8.3
- External Surface Service (grille, surround, doors and display & keypad assembly) - Section 8.4, beginning on page 8–5
- Engine And Engine Related Systems Service- Section 8.5, beginning on page 8–7
- Refrigerant System Service - Section 8.6, beginning on page 8–14
- Compressor and Unloader Service - Section 8.7, beginning on page 8–20
- Refrigerant System Component Service - Section 8.8, beginning on page 8–26
- Electrical System Component Service - Section 8.9, beginning on page 8–32.

Refer to the Table Of Contents to locate specific topics.

8.2 SCHEDULED MAINTENANCE

For the most reliable operation and for maximum life, your unit requires regular maintenance. This includes oil and filter changes, fuel and air cleaner replacement, coolant replacement and pretrip inspections. Maintenance is to be performed in accordance with the procedures provided in Table 8–1.

8.3 PRE TRIP INSPECTION

Pre trip inspection should be performed before every trip and at regular maintenance intervals. Pre trip procedures are provided in Table 8–2.

Table 8–1 Maintenance Schedule

System	Operation	Reference Section
a. Pre Trip Inspections		
	1 Pre Trip Inspection - before starting	8.3
	2 Pre Trip Inspection - after starting	8.3
	3 Run Microprocessor Pretrip - Before loading	3.4
	4 Check Engine Hours	3.14
b. Every Service Interval or Yearly		
Engine	1 Check engine oil and filter change interval (refer to Section **e.** of this table)	Section **e.**
	2 Check low oil pressure switch	Check
	3 Clean crankcase breather	8.5.14
	4 Check engine speeds	Table 2-1
	5 Check water pump belt	Check
Fuel System	1 Clean mechanical and electric (if equipped) fuel pump screens	8.5.3 & 8.5.4
	2 Change fuel filter	8.5.5
	3 Check fuel heater (if equipped)	8.5.7
Cooling System	1 Check coolant change interval (refer to Section **f.** of this table). If replacement is not required, check antifreeze concentration using a refractometer (Carrier Transicold part number 07-00435-00)	8.5.12 8.5.12
	2 Clean condenser & radiator surfaces	Check
	3 Check water pump	Check
	4 Check water temperature sensor	
Exhaust System	1 Check mounting hardware	Check
	2 Check muffler and exhaust pipes	Check
Air Intake System	1 Change air cleaner filter element	8.5.9
	2 Check and reset air cleaner indicator (if equipped)	Check
Starting Circuit	1 Clean battery connections and cable ends	Check/Replace
	2 Check battery hold down clamps	Check/Replace
	3 Check battery condition	Check
	4 Check starter operation	Check
Charging Circuit	1 Check battery charger output voltage	2.11
	2 Check battery charger amperage	2.11
A.C. Generator	1 Check voltage output	2.11
	2 Check amperage output	2.11
Unit	1 Check unit mounting bolts	Check
	2 Check engine and compressor mounting bolts	Check
	3 Check door latches & hinges	8.4.3
	4 Check unit switches and electrical connections	Check
	5 Check all electrical ground connections	Check
	6 Check control box condition	Check

Table 8–1 Maintenance Schedule - Continued

System	Operation	Reference Section
b. Every Service Interval or Yearly - Continued		
Refrigeration System	1 Check air switch and calibrate	8.8.9
	2 Check & clean the evaporator coil and all defrost drain hoses	8.8.1
	3 Install manifold gauge set and check refrigerant pressure	Check
	4 Check manual defrost operation	3.9
	5 Perform Microprocessor Pretrip	3.4
Electrical System	1 Check all ground connections for corrosion & tightness	Check
	2 Check Stand-by plug for signs of wear or damage	Check
	3 Check condenser fan amperage	2.11
	4 Check evaporator fan amperages	2.11
	5 Check compressor amperage	2.11
	6 Check heater amperages	2.11
	7 Perform insulation resistance verification for high voltage wiring, refer to Section 8.9.1.	- -
c. Every Second Service Interval or 2 years		
Cooling System	Drain and flush cooling system	8.5.12
d. Every 10,000 Hour Maintenance		
Perform complete annual Preventive Maintenance and the following:		
Fuel System	Clean and adjust injector nozzles.	Engine Service Guide

e. Oil Change Intervals	
Oil Type	**Oil Change / ESI Filter Change**
Petroleum	3000 hours or 2 yrs. (Maximum oil drain interval is 2 years.)
Mobile Delvac 1*	4000 hours or 2 yr (Maximum oil drain interval is 2 years.)
* Mobil Delvac1 is the only approved synthetic oil.	

f. Coolant Change Intervals	
Coolant Type	**Service Interval**
Standard	6000 hours or 2 yr
Extended Life	12000 hours or 5 yr

These maintenance schedules are based on the use of approved oils and regular Pretrip inspections of the unit. Failure to follow the recommended maintenance schedule may affect the life and reliability of the refrigeration unit.

Table 8–2 Pre Trip Inspection

WARNING		
Inspect battery cables for signs of wear, abrasion or damage at every pre trip inspection and replace if necessary. Also check battery cable routing to ensure that clamps are secure and that cables are not pinched or chafing against any components.		
BEFORE STARTING ENGINE	**OK**	**ADJUST**
Drain water from bottom of fuel tank	☐	☐
Drain water from water separator on fuel filter (if applicable)	☐	☐
Check radiator coolant level	☐	☐
Check condenser & radiator for cleanliness	☐	☐
Check air cleaner and hoses	☐	☐
Check engine oil level	☐	☐
Check condition of water pump belt	☐	☐
Check battery fluid level (if applicable)	☐	☐
Check battery cables and terminals	☐	☐
Check evaporator coil for cleanliness	☐	☐
Check bulkheads and return air screens	☐	☐
Check all defrost water drains	☐	☐
Place in continuous run and start unit	☐	☐
IMMEDIATELY AFTER STARTING ENGINE	**OK**	**ADJUST**
Check fuel lines and filter for leaks	☐	☐
Check oil lines and filter for leaks	☐	☐
Check coolant hoses for leaks	☐	☐
Check exhaust system for leaks	☐	☐
Check condenser fans for proper airflow.	☐	☐
Check evaporator fan for proper airflow.	☐	☐
Check for unusual noises	☐	☐
MICROPROCESSOR PRETRIP	**PASS**	**FAIL**
Initiate Pretrip	☐	☐
List Alarms occurring during Pretrip		
AFTER OPERATING UNIT FOR 15 MINUTES OR MORE	**OK**	**ADJUST**
Check refrigerant level	☐	☐
Check compressor oil level	☐	☐
Check for proper temperature control	☐	☐
Check Start-Stop Operation	☐	☐
Initiate defrost and allow to terminate	☐	☐
Check engine speeds	☐	☐

Table 8–2 Pre Trip Inspection - Continued

OPERATE UNIT IN HIGH SPEED COOL AND RECORD (From Microprocessor Unit Data)					
Suction Pressure		Battery Voltage		Unit Model #	
Discharge Pressure		Current Draw (DC)		Fuel Level*	
Evaporator Pressure		Engine RPM		Hrs to Engine Maint	
Engine Coolant Temp		Unit AC Current #1		Hrs to S/B Motor Maint	
Return Air Temp		Unit AC Current #2		Hrs to Unit Maint	
Supply Air Temp		CSMV %		Time Left to PM1*	
Delta-T		EVXV %		Time Left to PM2*	
Ambient Air Temp		Software Rev		Time Left to PM3*	
Defrost Term Temp		Display Software Rev		Time Left to PM4*	
Suction line Temp		Controller Serial #		Time Left to PM5*	
Evap Outlet Temp		Trailer/Vehicle/Car ID #		Datalogger (DataLink data recorder) Date/ Time	
Compr Disch Temp		Unit Serial #			

* Display is optional, record if displayed.

FINAL	**OK**	**ADJUST**
Review Functional Parameters	☐	☐
Download DataLink data recorder (if required)	☐	☐
Enter Trip Start In Microprocessor	☐	☐

8.4 EXTERNAL SURFACE SERVICE

Procedures for servicing or maintaining the grille, surround, doors, door latches and display & keypad assembly are provided in the following sub-paragraphs.

8.4.1 Grille Insert Removal

To remove the grille insert, do the following.

NOTE

If difficulty is experienced when attempting to remove the grille mounting bolts, the grille may be removed with the surround attached to allow access to the mounting clips. (Refer to Section 8.4.2.)

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove the 3 grille insert mounting bolts on each side of the grille insert, See Figure 8–1

c. Remove the 2 grille insert mounting bolts on top of the grille insert.

d. The grille is fitted with locating tabs along the bottom. To remove, swing insert down and lift out of locating slots.

e. Reverse above steps to install grille insert.

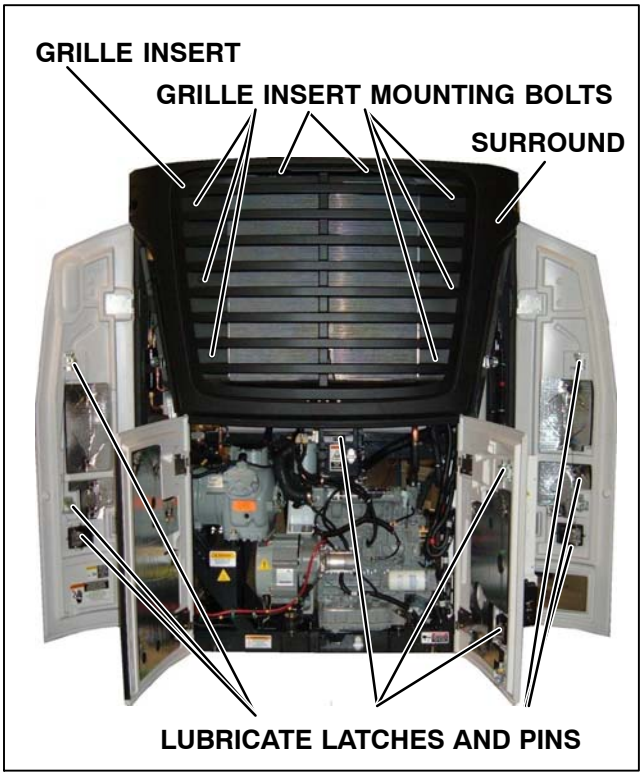


Figure 8–1 Grille Insert Removal And Door Latch Maintenance

8.4.2 Surround Removal

NOTE

It is not necessary to remove the grille before removing the surround.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power Switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Open both side and front doors.

c. Remove the bolts that secure the surround to the unit, see Figure 8–2.

d. Reverse above steps to install surround.

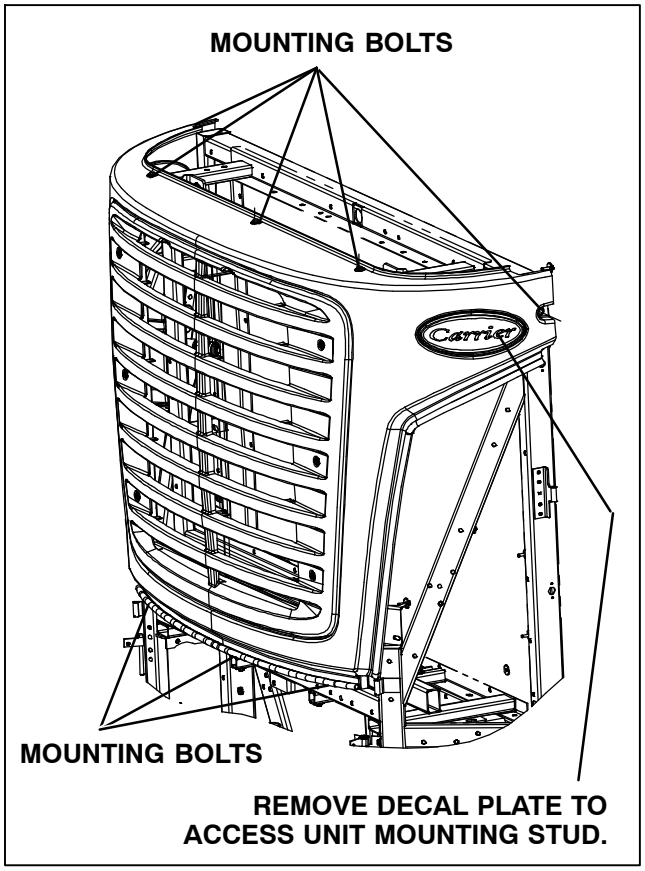


Figure 8–2 Surround Removal

8.4.3 Door Latch Maintenance And Replacement

a. Door Latch Maintenance

Proper maintenance is important for smooth operation of the latch assemblies and the latch pins that are mounted on the unit's frame (See Figure 8–1). In order to keep the movable parts clean and lubricated, CTD recommends the use of a de-greasing cleaner and LPS 2 lubricant. This lubricant should be available at any local automobile and truck parts suppliers.

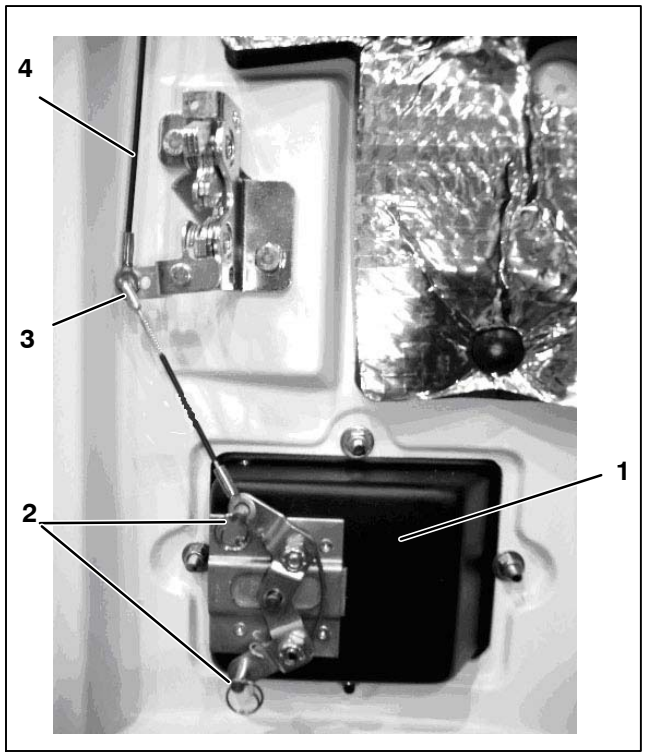
b. Cable Replacement

1. Remove circular clip that secures the cable to the paddle assembly. See Figure 8–3
2. Slide cable from paddle and rotate other end out of latch assembly.

NOTE

The side door lower cable is inserted through the upper cable eyelet. The lower cable is to be removed to gain access to the upper cable.

3. Reverse above steps to install new cable.



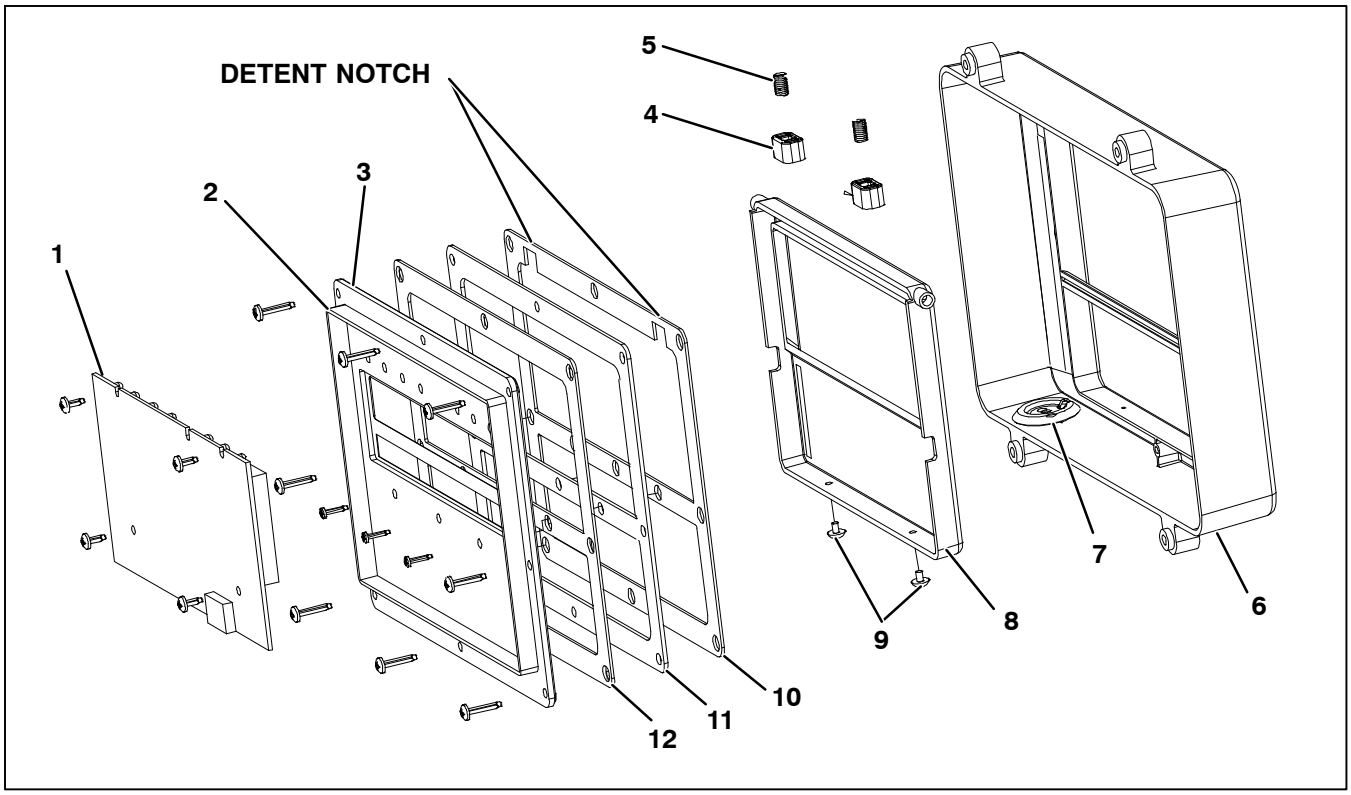
1. Paddle Assembly (Typical, Front & Side Doors)
2. Circular Clips (Typical, Front & Side Doors)
3. Lower Cable Upper Connection (Side Doors Only)
4. Upper Cable (Side Doors Only)

Figure 8–3 Door Latch Cable Removal

8.4.4 Display & Keypad Assembly

a. Disassembly

1. Place the Main Power switch in the OFF position. Disconnect the negative battery cable. Disconnect the high voltage source and lockout/tagout the receptacle. Attach a grounded wrist strap (Carrier Transicold part number 07-00304-00) and ground it to a good unit frame ground.
2. Disconnect wiring between the keypad & display assembly and harness.
3. Loosen and remove the (4) hex head 1/4-20 bolts holding the assembly to the unit, see Figure 8–4, and lay the assembly on a clean work surface. Re-ground wrist strap at new work surface.
4. Loosen and remove the (4) pan head screws holding the display board to the keypad support. Carefully separate the display board from the keypad support.
5. If additional disassembly is required, remove the eleven pan head screws (eight screws around the perimeter and three in the center) used to retain the keypad support, keypad, gaskets and window to the bezel.



1. Display Board
2. Keypad Support
3. Keypad
4. Latch
5. Spring
6. Bezel
7. Condensate Drain
8. Door
9. Plug
10. Gasket (Window to Bezel)
11. Window
12 Gasket (Keypad to Window)

Figure 8–4 Display and Keypad Assembly

b. Reassembly

⚠ CAUTION

Do not over torque display & keypad pan head screws. Torque all screws to 60 in lbs (6.8 Nm).

NOTE

All gaskets must be replaced any time the keypad support is removed from the bezel. All replacement display bezel assembly kits are packaged with replacement gaskets.

1. Clean all gasket surfaces and install keypad support, keypad, gaskets and window to the bezel in the correct order, see Figure 8–4 Install the 11 mounting screws.
2. Install the display board. and reconnect wiring between the keypad & display assembly and harness.
3. Reconnect negative battery cable and standby plug as required and run Pretrip to check unit operation.

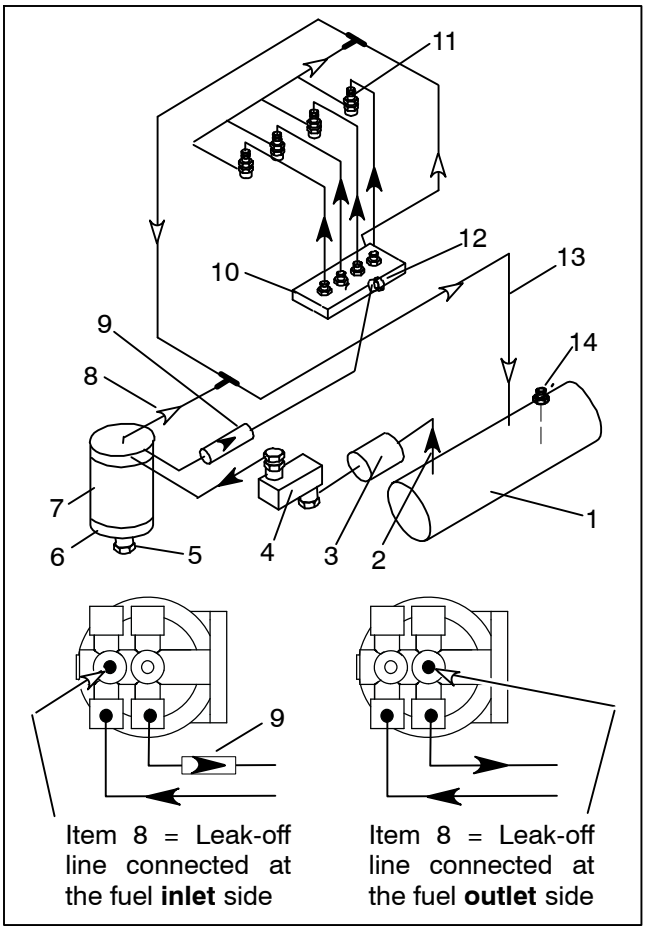
8.5 ENGINE AND ENGINE RELATED SYSTEMS SERVICE

Procedures for servicing the engine, fuel system, engine cooling system and air cleaner are provided in the following sub-paragraphs.

8.5.1 Fuel System

The fuel system (see Figure 8–5) consists of the fuel tank, mechanical lift pump, fuel filter, fuel injection pump, the injectors and interconnecting tubing. The fuel system may also be equipped with an optional electric pump and/or optional electric fuel heater.

Two fuel system configurations have been used. The first has the leak-off line at the inlet side of the filter (with an outlet line check valve) and the second has the leak-off line at the outlet side of the filter (without an outlet line check valve).



1. Fuel Tank
2. Supply Line
3. Electric Pump
4. Mechanical Pump
5. Water Separator
6 Heater
7. Filter
8. Filter Leak-Off Line
9. Check Valve*
10. Injection Pump
11. Injector Nozzles
12. Bleed Screw
13. Return Line
14. Level Sensor

* CHECK VALVE USED WHEN LEAK-OFF LINE IS INSTALLED AT THE INLET CONNECTION ONLY

Figure 8–5 Fuel System Diagram

8.5.2 Priming The Fuel System

The mechanical fuel lift pump (See Figure 8–6) is mounted on the engine next to the injection pump. This pump has a manual plunger for priming the fuel system when the fuel tank has been run dry.

To prime the fuel system, use the following steps:

a. Turn the bleed valve (red) counter-clockwise until fully opened.

b. Turn the top of the manual plunger counter-clockwise to unlock it. **S-L-O-W-L-Y** (up/down once per second) pump the manual plunger until positive pressure (resistance) is felt. This may take up to 200 strokes. This will indicate fuel flow.

c. Continue to pump **S-L-O-W-L-Y** (up/down once per second) approximately 100 more strokes to fill the filter and bleed the air out of the lines.

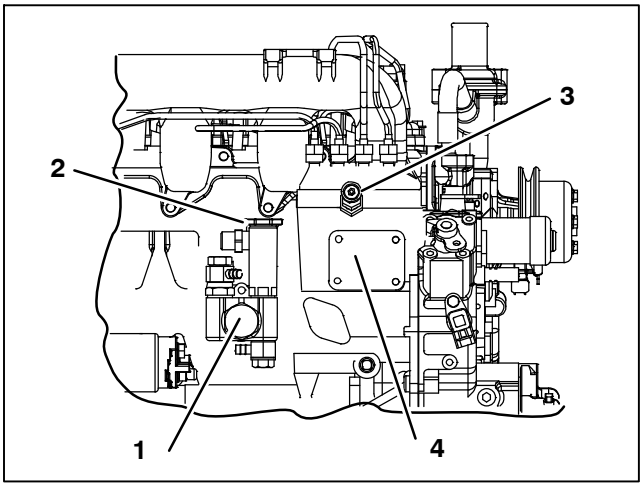
d. Start engine. It may be necessary to continue to pump until the engine starts.

⚠ CAUTION

Running the engine for an extended period of time with the manual plunger up can cause a priming pump failure

e. Depress and turn the top of the manual plunger clockwise to **lock in place.**

f. When engine is running smoothly, turn bleed valve clockwise until fully closed.

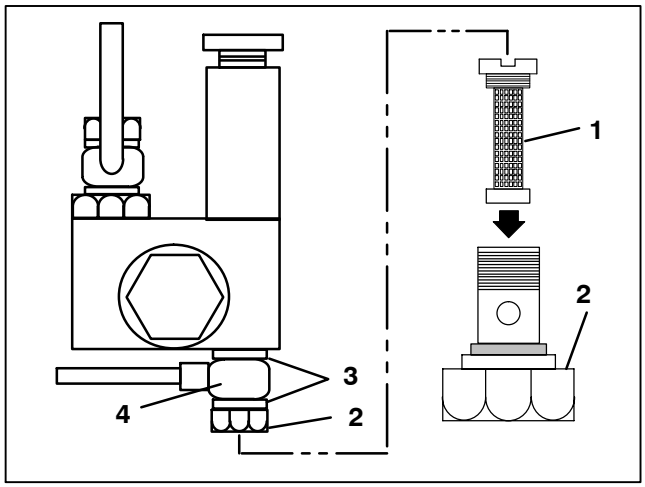


1. Mechanical Fuel Lift Pump
2. Manual Plunger
3. Bleed Screw
4. Injection Pump

Figure 8–6 Fuel Bleed Components

8.5.3 Mechanical Fuel Pump Screen

The fuel screen (See Figure 8–7) may become plugged or restricted with foreign particles or wax as a result of using the wrong grade of fuel or untreated fuel in cold weather. This will cause the engine to lose power. The screen must be cleaned on a regular schedule such as unit pre-trip or when the oil and fuel filters are changed. (Refer to Section 8.2).



1. Screen
2. Nut
3. Copper Rings
4. Banjo Fitting

Figure 8–7 Mechanical Fuel Pump

To check or replace Screen

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Turn nut (Item 2, Figure 8–7) counter-clockwise to loosen and remove it .

c. Remove banjo fitting (Item 4) and let it hang loose. Discard copper rings (Item 3) and replace with new ones.

d. Turn screen (Item 1) counter-clockwise and remove. Check and clean.

e. To install reverse above steps.

f. Start unit and check for leaks.

8.5.4 Electric Fuel Pump Screen

To check or replace Screen

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power Switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove 3 screws from cover (See Figure 8–8).

c. Remove cover, gasket and screen.

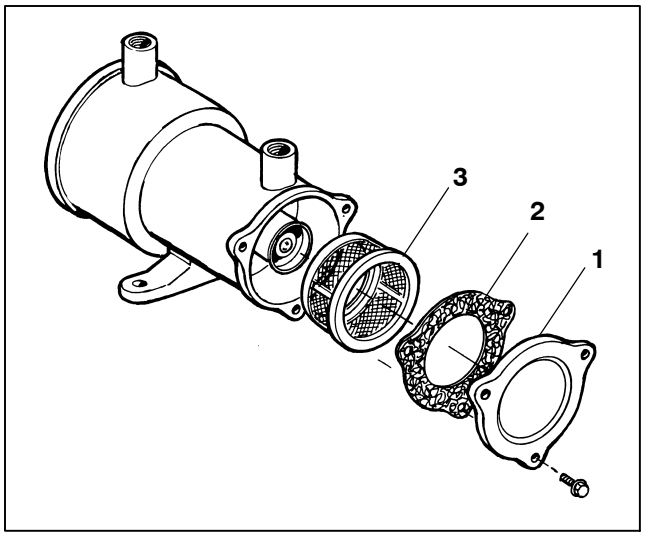
⚠ WARNING

Use the required protective eye wear and clothing when working with solvents.

d. Wash screen in cleaning solvent and blow out with air pressure. Clean cover.

e. To Install reverse above steps.

f. Start unit and check for leaks.



1. Cover 2. Gasket 3. Screen

Figure 8–8 Electric Fuel Pump

8.5.5 Fuel Filter

To replace filter:

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Place a shallow pan under filter (item 7, Figure 8–5) and open the water separator (item 5) to drain contents.

c. Remove water separator and O-ring and then remove element.

d. Install water separator on new element using new O-ring.

e. Fill new element with clean diesel fuel, lubricate the seal and install. Tighten firmly by hand.

f. Start unit and check for leaks.

8.5.6 Fuel Level Sensor (FLS)

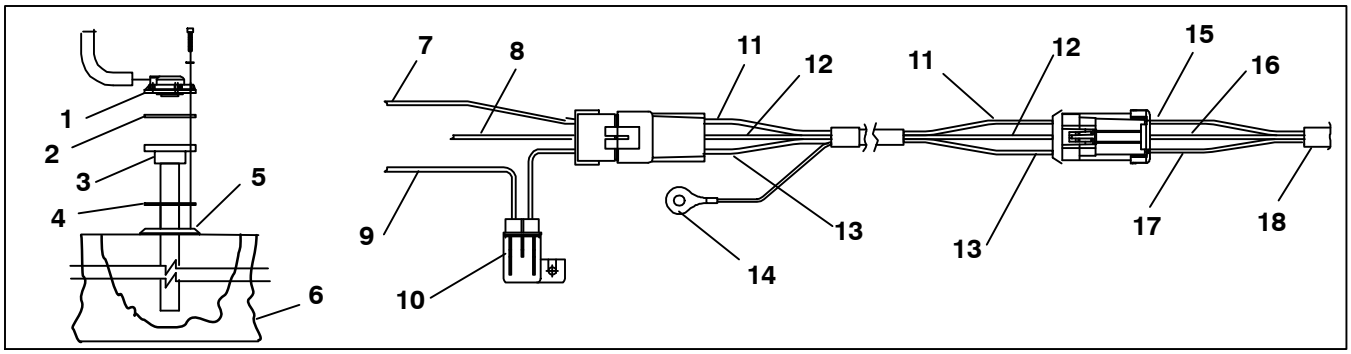
An optional fuel level sensor (item1, Figure 8–9) supplies an input signal to the microprocessor as to the % of fuel remaining in the fuel tank. The microprocessor will activate the A1 = “LOW FUEL LEVEL WARNING” alarm when the level reaches 15%, and (if configured to do so) shuts the engine down when the level reaches 10%. The fuel tank level is be displayed in the Unit Data.

To Check The Fuel Level Sensor, do the following

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Verify that the fuse (FLS) is not open. See Figure 8–9.

c. Verify that the wiring is correct, cable shield is properly grounded and condition of connectors. No damage to sensor; no damage, moisture or corrosion in connectors.



1. Fuel Level Sensor
2. Gasket
3. Focus Tube
4. Sensor Flange
5. Fuel Level Sensor Flange
6. Fuel Tank
7. Wire 1MP26 - FLSC (Connection C)
8. Wire SP6 - FLSB (Connection B)
9. Wire SP5 - FLSA (Connection A)
10. Fuse (FLS = 3A)
11. White Wire (Connection C)
12. Black Wire (Connection B)
13. Red Wire (Connection A)
14. Ground (Shield)
15. Yellow Wire (Connection C)
16. Black Wire (Connection B)
17. Red Wire (Connection A)
18. Wires From Sensor

Figure 8–9 Fuel Level Sensor

d. Energize sensor circuit, refer to Note 2, page 7–2. Check power (approximately 12 VDC) from SP5 (9, Figure 8–9) through to connector (13). Check ground from SP6 (8) through connector (12). Check signal (greater than 0.24 VDC and less than 5VDC) at microprocessor (1MP-26).

e. If checks in the preceding step are OK, remove the fuel level sensor, focus tube and gaskets. With the trailer level, verify that the fuel level sensor flange is within one-half bubble of level using a 24 inch level. Adjust tank mounting as required.

⚠ CAUTION

Torque fuel level sensor mounting screws to 15 to 18 inch/pounds. DO NOT over tighten, as little as 20 inch/pounds will damage the sensor.

f. Using new gaskets, reinstall fuel level sensor components. The mounting holes are not symmetrical, there is an alignment hole in the sensor, alignment holes and index dimples in the gaskets and an alignment notch in the focus tube flange to assist in aligning the components. Install mounting screws and washers in all mounting holes and bring to finger tight. Tighten in accordance with the instructions provided in the preceding CAUTION

g. With the fuel tank empty the output reading should be approximately 0.25 VDC.

h. With the fuel tank full, the output reading should be approximately 4.75 VDC.

i. Start unit and check for leaks.

8.5.7 Fuel Heater

The optional fuel heater (item 6, Figure 8–5) applies heat to fuel in the fuel filter. Heating the fuel dissolves / prevents paraffin wax crystals (and ice) that form when diesel fuel is chilled thus enabling the water separator to work more efficiently and to prevent the filter from plugging with wax and/or ice crystals. When the ambient air sensor is reading 77°F (25°C) or higher, the microprocessor will not enable this circuit. Also, the heater is fitted with an internal temperature switch (FHTS - see schematic diagrams, Section 10) which will close, on a temperature fall, to energize the heater element at temperatures below 45°F (7.2°C) and open, on a temperature rise, to de-energize the heater element at 75°F (23.9°C).

To test the fuel heater, do the following:

a. Using Unit Data (refer to Section 3.13), check to ensure the Ambient Air Temperature reading is below 77°F (25°C), if the reading is below this temperature the fuel heater relay (FHR) should be energized. If the relay does not energize, check for power from microprocessor terminal 4MP16 to the relay coil and ground from the coil connector.

b. Check for power from SP50, through fuse F19, the relay contacts and HC16 to the fuel heater connector. Check also for ground from the fuel heater connector to SP 6.

c. If the fuel heater temperature is below 45°F (7.2°C) replace the fuel heater. If the fuel heater temperature is above 45°F (7.2°C), the internal temperature switch may be open. Retest at a temperature below the switch close point as soon as conditions allow.

8.5.8 Engine Oil And Oil Filter

a. To Check The Engine Oil Level:

1 Warm up the engine and then stop it by placing the Main Power switch in the OFF position. Ensure the unit will not start automatically by disabling any two way communication. Disconnect the high voltage source and lockout/tagout the receptacle.

2 Unscrew the cap/dipstick see Figure 8–10. Wipe the dipstick clean and insert the cap into the oil fill tube without threading into tube.

3 Remove the dipstick again and check oil level. DO NOT add oil if the level is in the “safe” range. If needed, add oil as indicated by markings on dipstick until level is in the “safe” range.

4 After checking or adding oil as necessary, ensure cap is threaded back onto oil fill tube.

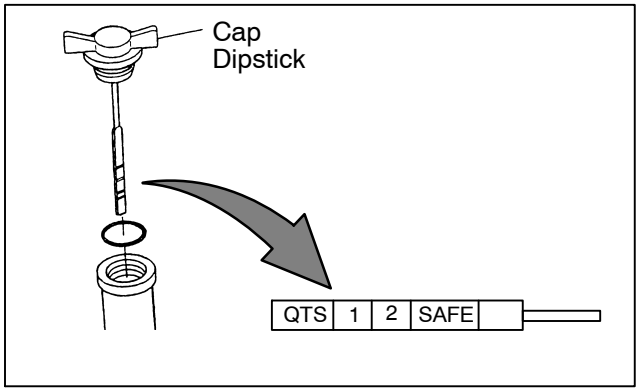
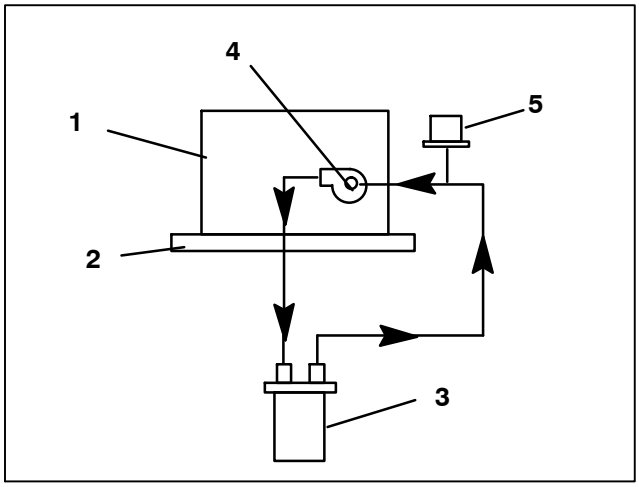


Figure 8–10 Engine Oil Level



1. Engine Block
2. Oil Pan
3. Oil Filter
4. Engine Oil Connection
5. Oil Pressure Switch

Figure 8–11 Engine Oil Flow Diagram

b. To Change Engine Oil:

1 Warm up the engine and then stop it by placing the Main Power switch in the OFF position. Ensure the unit will not start automatically by disabling any two way communication. Disconnect the high voltage source and lockout/tagout the receptacle.

2 If available, install oil drain tool (CTD P/N 68-15763-00). See Figure 8–12. The Oil Drain Tool not only directs the oil over the door latch pin bracket and bottom panel, on units so equipped, but also holds a typical drain bucket in place while the oil is draining from the engine.

3 Remove drain plug drain engine oil. Replace plug and refill engine with oil. Continue with step c. and change oil filter.



Figure 8–12 Oil Drain Tool

c. To Change Engine Oil Filter:

1 If not continuing from preceding step b., warm up the engine and then stop it by placing the Main Power switch in the OFF position. Ensure the unit will not start automatically by disabling any two way communication. Disconnect the high voltage source.

2 Remove oil filter. Ensure filter mounting is clean.

⚠ CAUTION

When changing oil filters, the new filters should be primed (partially filled) with clean oil if possible. If the filters are not primed, the engine may operate for a period with no oil supplied to the bearings.

3 Lightly oil gasket on new filter before installing. Tighten 3/4 to 1 turn after the seal makes contact.

4. Start unit and check for leaks.

8.5.9 Air Cleaner

The air cleaner should be inspected regularly for leaks. A damaged air cleaner or hose can seriously affect the performance and life of the engine. The air cleaner is designed to effectively remove contaminants from the air stream entering the engine. An excessive accumulation of these contaminants in the air cleaner will impair its operation; therefore, a service schedule must be set up and followed.

An air cleaner service indicator is connected to the intake manifold. Its function is to indicate when the air cleaner requires replacement. During operation: when a plugged air cleaner causes the intake manifold pressure to drop to 20” (500 mm) WG, the indicator will move to the red line. The air cleaner should then be replaced and the indicator reset by pressing the reset button.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source.

b. Check all connections for mechanical tightness. Be sure filter outlet pipe is not fractured.

c. Release 2 clips on air cleaner housing and remove the cover.

d. Remove filter element, wipe inside of air cleaner housing clean inspect element and replace if required.

e. Wipe inside of the cover and re-install.

f. Re-secure 2 clips on air cleaner housing.

g. Reset air cleaner service indicator.

8.5.10 Intake Air Heater

The circuit amp draw for the air heater circuit is checked during a Pretrip cycle. Refer to Section 2.12 for amperage and resistance values.

a. Troubleshooting The Intake Air Heater (IAH)

1 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

2 Disconnect the lead.

3 Measure the resistance between the + terminal and the heater body.

4 If the resistance is infinite or zero, the intake air heater is faulty and must be replaced.

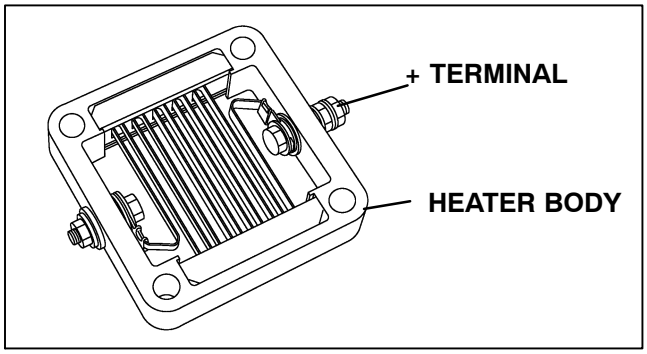


Figure 8–13 Intake Air Heater

b. Replacing The Intake Air Heater

1 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

2 Remove the inlet hose.

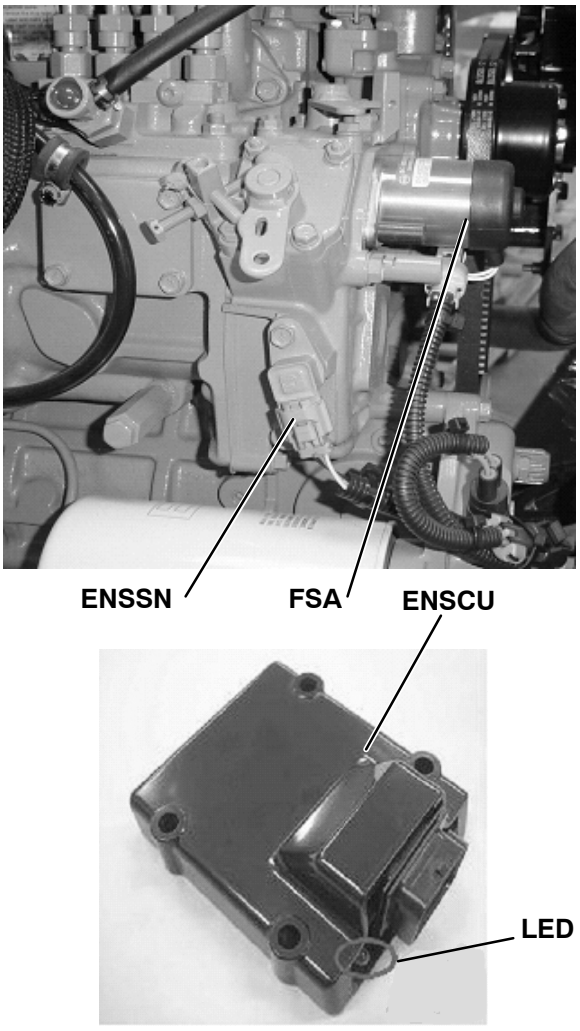
3 Disconnect the lead.

4 Remove the flange, intake air heater and gaskets.

NOTE

To avoid short-circuiting the heater, ensure that the heater and the heater elements are vertical when assembling to the intake manifold. The plus terminal is to be mounted towards the front of the unit.

5 Clean gasket surfaces and reinstall intake air heater and flange using new gaskets. Torque flange bolts to 11 to 18 ft/lbs (15 to 24 nm).



The ENSCU is located on the air cleaner bracket - see item 4,Figure 2–3)

Figure 8–14 Electronic Speed Control Components

8.5.11 Speed Control System

Engine speed is controlled by three components: the engine speed control unit (ENSCU), the fuel/speed actuator (FSA) and the engine speed sensor (ENSSN).

The ENSSN provides the speed signal to the ENSCU.

The ENSCU starts, stops and controls the speed of the engine by varying the position of the FSA rod. It also provides a speed signal to the microprocessor.

The FSA combines the fuel shutoff solenoid and speed control solenoid into one component.

The ENSCU is fitted with an alarm LED which may be used to diagnose failures within the system. Refer to Section 10 for wiring schematic and to Section 9.5 for Speed Control System Diagnostics.

8.5.12 Cooling System

a. Cleaning and Flushing

Air flows through the condenser and then the radiator. The cooling surfaces of both must be clean and the interior of the radiator must be clean for adequate cooling.

⚠ CAUTION

Use only ethylene glycol anti-freeze (with inhibitors) in system as glycol by itself will damage the cooling system. Always add pre-mixed 50/50 anti-freeze and water to radiator/engine. Never exceed more than a 60% concentration of anti-freeze. Use a low silicate anti-freeze meeting specification GM 6038M for standard life coolant or use Texaco Havoline extended life coolant or any other extended life coolant which is Dexcool approved and has 5/150 (5 years/150,000 miles) on the label.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Remove all foreign material from the condenser coil and radiator by reversing the normal air flow. (Air is pulled in through the front and discharges over the engine.) Compressed air or water may be used as a cleaning agent.

⚠ WARNING

Do not remove the cap from a hot radiator or bottle; if the cap must be removed, do so very slowly in order to release the pressure without spray.

NOTE

Draining the coolant from the engine petcock will leave approximately 1 quart (.9 liters) of coolant in the block.

3. Drain coolant completely by removing radiator cap and then the lower radiator hose.

⚠ CAUTION

NEVER POUR COLD WATER INTO A HOT ENGINE, however hot water can always be added to a cold engine.

4. Install hose and fill system with clean, untreated water.

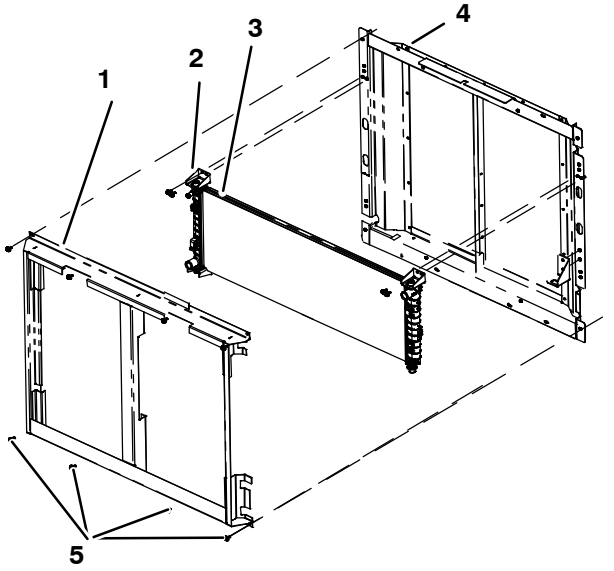
NOTE

Only clean water should be used to flush the cooling system. Do not use any radiator flush or detergents to clean the radiator.

5. Start the engine and drain system while warm. Rinse system three times after it has cooled down. Refill system with water.
6. Run engine to operating temperature. Drain system again and fill with 50/50 water/anti-freeze mixture. (see Caution Note at the beginning of this section.)

b. Radiator Replacement

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Drain coolant completely by removing radiator cap and then the lower radiator hose.
3. Remove condenser fans, refer to Section 8.9.7. When removing the road side fan assembly, remove the condenser to subcooler line support bracket completely, to allow clearance for coil removal.
4. Remove the radiator frame assembly mounting bolts (see Figure 8–15) and and remove the radiator frame assembly.
5. Remove top radiator mounting brackets and remove the radiator through the top of the unit.
6. Re-assemble in reverse order of removal.
7. Flush and fill radiator with coolant. (Refer to section 8.5.12.)



Condenser coil not shown, for clarity

1. Radiator Frame Assembly
2. Radiator Mounting Bracket
3. Radiator
4. Condenser Frame Assembly
5. Radiator Frame Mounting Bolts

Figure 8–15 Condenser And Radiator Assemblies

8.5.13 Water Pump V-Belt

WARNING

Beware of moving poly V-belt and belt driven components.

WARNING

When working with belts, beware of pinch points.

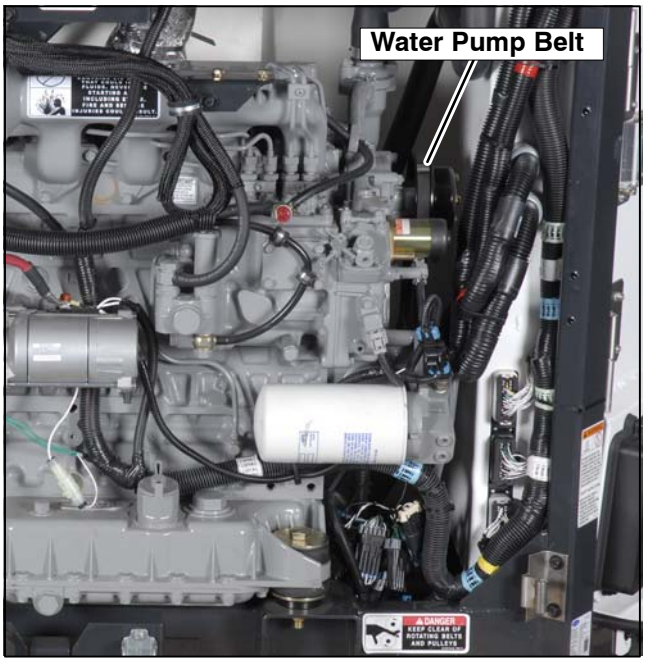


Figure 8–16 Water Pump V-Belt

The water pump v-belt is driven by a sheave on the engine crankshaft. Frayed, cracked or worn belts must be replaced. This belt is a one time use only type and requires no tension adjustment.

To replace the poly V-belt, perform the following steps:

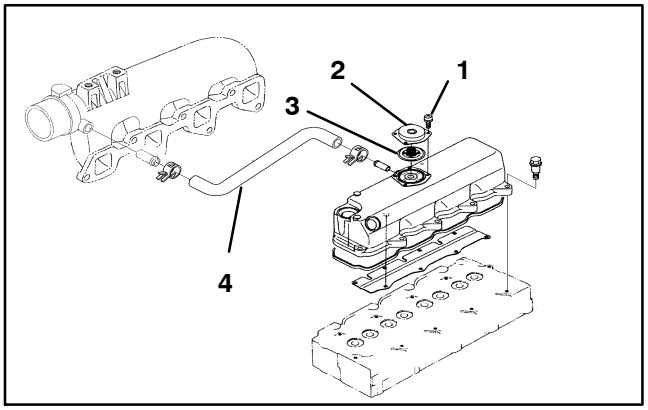
a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Using the proper size socket, slowly rotate the crank by turning the crank pulley nut. At the same time, use a flat, blunt object to guide the belt off the crank pulley. Be careful not to damage grooves on the pulley.

c.. Replace the poly V-Belt by positioning the belt on the water pump pulley, and while rotating the engine (as in step 1), use a flat, blunt object to guide the belt onto the crank pulley. Be careful not to damage grooves on the pulley or belt.

8.5.14 Crankcase Breather

The engine uses a closed type breather with the breather line attached to the cylinder head cover. (See Figure 8–17)
The breather assembly should be cleaned once a year or at every 2000 hours maintenance interval (whichever comes first). See Table 8–1



1. Screw
2. Breather Cover
3. Breather Valve
4. Breather Tube

Figure 8–17 Engine Crankcase Breather

8.6 REFRIGERANT SYSTEM SERVICE

Service of the refrigerant system includes: connection of refrigerant system equipment, servicing the refrigerant charge, leak checking and evacuation. Procedures for refrigerant system service are provided in the following sub paragraphs.

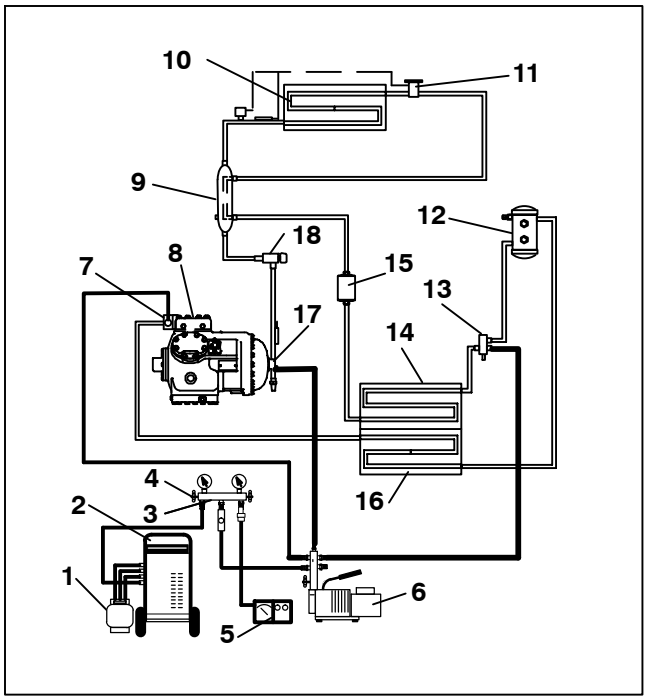
8.6.1 Refrigerant System Service Connections

To service the refrigerant system, service equipment is connected to the system at the compressor discharge service valve, compressor suction service valve and/or the liquid line service valve.

When connecting to a valve, backseat the valve (turn counterclockwise) to close off gauge connection and attach service line to the valve. Open valve 1/4 to 1/2 turn (clockwise) and then purge the service line. See Figure 8–18 for an example of a full service connection setup.

NOTE

To avoid damage to the earth's ozone layer, use a refrigerant recovery system whenever removing refrigerant from a refrigeration system. When working with refrigerants you must comply with all local government environmental laws, U.S.A. EPA section 608.



1. Refrigerant Cylinder
2. Refrigerant Recovery Unit
3. Manifold Gauge Set
4. Valve
5. Vacuum Indicator
6. Vacuum Pump
7. Discharge Service Valve
8. Compressor
9. Heat Exchanger
10. Evaporator
11. Electronic Expansion Valve
12. Receiver
13. Liquid Line Service Valve
14. Subcooler
15. Filter-Drier
16 Condenser
17 Suction Service Valve
18 Compressor Suction Modulation Valve (CSMV)

Figure 8–18 Refrigerant System Service Equipment

8.6.2 Servicing The Refrigerant Charge

Servicing of the refrigerant charge includes: checking the charge level, checking for noncondensibles, removing the charge, pumping down the low side, pumping down the compressor, adjusting the charge level and adding a complete charge. Procedures for charge service are provided in the following sub paragraphs.

a. Checking Charge Level

Check the refrigerant charge before adding any refrigerant to the system. Only add refrigerant if charge is low. If charge is low, leak checking must be performed (Refer to Section 8.6.3) and all leaks repaired before adding refrigerant.

1. Install a manifold gauge set to allow reading of discharge pressure. See Figure 8–18.
2. Start unit in Continuous Run Operation. Adjust set point so that unit is running in high speed, fully loaded and operating in cooling. Run approximately ten minutes - until the refrigeration system is warmed up and the refrigerated compartment temperature is approaching set point.
3. Partially block off air flow to condenser coil so discharge pressure rises to 230 psig (15.7 bar).
4. Check the receiver sight glasses to determine charge. The system is correctly charged when the lower sight glass is not empty and the upper sight glass is not full.
5. If the system appears to be overcharged or under charged, adjust charge. Refer to following step f.

b. Checking For Noncondensibles

To check for noncondensibles, proceed as follows:

1. Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8–18.
2. Stabilize system to equalize pressure between the suction and discharge side of the system. The refrigerant system needs to be off for several hours.
3. Measure temperature at the copper tubing leaving the condenser (not the subcooler).
4. Record compressor discharge pressure.
5. Determine saturation pressure as it corresponds to the condenser temperature using the temperature pressure chart, Table 8–7.
6. If gauge reading is not close to the calculated saturation pressure in step 5, noncondensibles or mixed refrigerants are present.
7. Remove refrigerant. Refer to following step c.
8. Leak check, evacuate and recharge the system.

c. Removing Charge

To remove the refrigerant charge, proceed as follows:

1. If the system is in operating condition, it will be quicker to remove the charge by continuing with step 2. If the system is not in operating condition, skip steps 2 through 5 and continue with step 6.

2 Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8–18.

⚠ CAUTION

Only a refrigerant cylinder that has previously been used with R404A should be connected to this refrigeration unit.

3. Connect a clean, evacuated refrigerant cylinder to the liquid line service valve connection. Place the cylinder on a weight scale so the refrigerant going into the cylinder can be monitored.
4. Start the unit and run in high speed cool. Cover the condenser to raise the discharge pressure to as high as 375 psig (25.5 bar). Do not let the discharge pressure exceed 400 psig (27.2 bar). Open the refrigerant cylinder valve, and allow the refrigerant to flow into

the cylinder. The amount of refrigerant going into the cylinder can be monitored by watching the weight of the cylinder.

5. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar). There should be very little refrigerant remaining in the system at this point.
6. Place the unit in Service Mode (Refer to Section 5.2.3). Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the refrigerant removal procedures. If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.
7. Connect a refrigerant recovery device and a clean refrigerant recovery cylinder (or continue to use the same cylinder used in step 3) as shown in Figure 8–18 and remove any remaining refrigerant from the system.
8. Refer to instructions provided by the manufacturer of the refrigerant recovery unit.
9. After making necessary repairs, leak check, evacuate and recharge the system.

d. Pumping Down The Low Side

Components on the low side of the refrigeration system (the filter-drier, EVXV, evaporator coil, evaporator outlet pressure transducer, CSMV, heat exchanger, suction line etc.) may be serviced or replaced without having to completely remove the refrigerant charge from the system by pumping down the low side, and temporarily storing the refrigerant in the condenser and receiver.

1. Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8–18.
2. Start the unit.
3. Frontseat the liquid line service valve.
4. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar). There should be very little refrigerant remaining in the low side of the system at this point.
5. Monitor the gauges. The suction pressure should not rise rapidly. If the suction pressure continues to rise, the liquid line service valve may not be closed properly. In this case, the low side cannot be pumped down and the entire refrigerant charge must be removed from the system. (Refer to preceding step c.)
6. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
7. Frontseat (close by turning clockwise) the discharge service valve and the refrigerant will be trapped between the compressor discharge service valve and the liquid line service valve.
8. Before opening up any part of the low side of the system, a slight positive pressure should be indicated on the pressure gauge. If the pressure is below 0 psig/bar slowly open the liquid line service valve slightly and then frontseat the valve again. Repeat as necessary in order to raise the pressure above 0.
9. Connect a refrigerant recovery device and a clean refrigerant recovery cylinder to the suction and discharge service valves and remove any remaining refrigerant from the low side. DO NOT bring the low side pressure below 0 psig/bar.
10. After making necessary repairs, leak check and evacuate the low side of the refrigeration system. (Refer to Sections 8.6.3 and 8.6.4.)

e. Pumping Down The Compressor

The compressor or any of the components attached to it (unloaders, high pressure switch, discharge and suction pressure transducers, discharge temperature sensor, compressor heads and oil, etc.) may be serviced or replaced by pumping the compressor down, and isolating the compressor from the rest of the system.

1 Install a manifold gauge set to allow reading of suction and discharge pressure. See Figure 8–18.

2 **If the compressor is operational,** start the unit and slowly frontseat the suction service valve. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar). Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle. Frontseat the discharge service valve to isolate compressor. There should be very little refrigerant remaining in the compressor at this point.

3 **If the compressor is not operational,** ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle. and then frontseat both the discharge and suction service valve to isolate the compressor.

4 Connect a refrigerant recovery device and a clean refrigerant recovery cylinder to the suction and discharge service valves and remove any remaining refrigerant from the compressor. DO NOT bring the compressor pressure below 0 psig/bar.

5. After making necessary repairs, leak check and evacuate the compressor. (Refer to Sections 8.6.3 and 8.6.4.)

f. Adjusting The Charge Level

Adjustment of the charge level may be required when there has been a leak or the system was not correctly charged during a previous service.

1 Check charge level by performing the procedures of the preceding step a.

2 If charge removal is required: connect a clean evacuated refrigerant recovery cylinder to the liquid line service valve. Open liquid valve on cylinder. Midseat liquid line service valve and monitor the liquid refrigerant flow into the cylinder. If the unit is operating, close the cylinder valve and backseat the liquid line service valve when the ball in the upper sight glass drops to the bottom of the glass. It the unit is not operating, when approximately 5 lbs. (2.3 kg) have been removed close the cylinder valve and backseat the liquid line service valve. Proceed to step 7

3 If charge is to be added: place cylinder of refrigerant on a scale and connect a charging line and gauge from cylinder to liquid line service valve. Start unit in Continuous Operation with a set point lower than refrigerated compartment temperature. Wait until unit switches to high speed operation. Run approximately ten minutes.

4 Note weight of cylinder and refrigerant.

5 Frontseat the liquid line service valve (turn clockwise) and watch the pressure on the manifold gauge. When the pressure falls below the pressure in the refrigerant cylinder [or to 50 psig (3.4 bar)], open the cylinder valve and monitor the liquid refrigerant to flow into the unit.

6 When approximately 5 lbs. (2.3 kg) have been added, close the cylinder valve, and backseat the liquid line service valve.

7 Recheck for the correct refrigerant charge. (Refer to preceding step a.) Repeat preceding steps as required. When charge level adjustment is complete, remove refrigerant service equipment.

g. Adding a Complete Charge

1 Evacuate unit and leave in deep vacuum. (Refer to Section 8.6.4.)

2 Determine charge required for this unit (refer to the model/serial number nameplate or Table 2-1) and procure a refrigerant cylinder with sufficient weight of refrigerant. Place cylinder on scale and connect charging line from cylinder to liquid line service valve.

3 Note weight of cylinder and refrigerant.

4 Open liquid valve on cylinder. Midseat liquid line service valve and allow the liquid refrigerant to flow into the unit until the correct weight of refrigerant has been added.

NOTE

It is possible that all liquid may not be pulled into the receiver, as outlined in step 4. In this case, add the additional refrigerant in accordance with the charge adjustment procedures, refer to preceding step f.

5 When scale indicates that the correct charge has been added, close liquid line valve on cylinder and backseat the liquid line service valve. Remove charging hose.

8.6.3 Leak Checking

The condition that the system may be in when leak checking is required include; when the system is charged, when the system is without charge, when the low side has been pumped down and when only the compressor is to be leak checked. Procedures for each condition are provided in the following subsections.

a. Leak Checking a Charged System

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

NOTE

Service Mode is not required for this procedure.

2. Verify that the suspected leak area (high or low side) has sufficient pressure [minimum 20 psig (1.4 bar)] to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater the pressure required.
3. The recommended procedure for finding leaks from a system is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.
4. Some leaks may be repaired by simply tightening a connection. Others may require removal of the charge, refer to Section 8.6.2.
5. Check for proper unit operation by running Pretrip (Refer to Section 3.4).

b. Leak Checking a System Without Charge

The refrigeration system must be leak checked once it is closed and all repairs complete.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.
2. Connect refrigerant system equipment if not already connected. Refer to Figure 8–18

⚠ CAUTION

Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.

⚠ CAUTION

Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.

3. Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the pressurizing and leak checking procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

4 Pressurize the system to 5 to 10 psig (0.3 to 0.7 bar) with refrigerant at the liquid line service valve.

⚠ WARNING

Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 2350 psig (159.9 bar). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8–30)

5 Connect a cylinder of dry nitrogen. Use the dry nitrogen to increase the pressure as necessary to 20 to 150 psig (1.4 to 10.2 bar) to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater pressure is required

6 The recommended procedure for finding leaks from a system is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.

7. Once leak checking is complete, remove the refrigerant/nitrogen vapor out of the system.

8. If no leaks are found the system is ready for evacuation. (Skip to Step 11)

9. If any leaks are found they must be repaired before proceeding.

10 Repeat steps 4 thru 9 as necessary.

11. Evacuate the system after all leaks are repaired. (Refer to Section 8.6.4.)

c. Leak Checking With Low Side Pumped Down

The low side of the system must be leak checked once it is closed and all repairs complete.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

⚠ CAUTION

Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.

2. Connect refrigerant system equipment if not already connected. Refer to Figure 8–18

⚠ CAUTION

Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.

3. Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the pressurizing and leak checking procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

4. Pressurize the low side of the system to 5 to 10 psig (0.3 to 0.7 bar) with refrigerant from the high side by turning the liquid line service valve off frontseat for a few seconds and then returning to frontseat.

⚠ WARNING

Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 2350 psig (159.9 bar). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8–30)

5. Connect a cylinder of dry nitrogen. Use the nitrogen to increase the low side pressure to 20 to 150 psig (1.4 to 10.2 bar) to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater the pressure required

6. The recommended procedure for finding leaks from a system is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.

7. Once leak checking is complete, remove the refrigerant/nitrogen vapor from the low side of the system.

8. If no leaks are found the low side of the system is ready for evacuation. (Skip to Step 11)

9. If any leaks are found they must be repaired before proceeding.

10. Repeat steps 4 thru 9 as necessary.

11. Disconnect the nitrogen cylinder. Evacuate the low side of the system after all leaks are repaired. (Refer to Section 8.6.4.)

d. Leak Checking Compressor

The compressor and its associated switches, transducers, etc. must be leak checked once the compressor is closed and all repairs complete.

1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

2. Connect refrigerant system service equipment to the suction and discharge service valves, if not already connected. Refer to Figure 8–18.

⚠ CAUTION

Only a refrigerant cylinder containing R404A should be connected to this refrigeration unit in order to pressurize the system. However, dry nitrogen may be used to increase pressure. Any other gas or vapor will contaminate the system and require additional removal and evacuation.

⚠ CAUTION

Do not vapor charge R404A. Only liquid charging through the liquid line service valve is acceptable.

3. Pressurize the compressor to 5 to 10 psig (0.3 to 0.7 bar) by opening the suction service valve for a few seconds, then closing (frontseating) it again.

⚠ WARNING

Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 2350 psig (159.9 bar). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8–30.)

4. Connect a cylinder of dry nitrogen. Use the nitrogen to increase the compressor pressure to 20 to 150 psig (1.4 to 10.2 bar) to detect the leak. The larger the leak the less pressure is required. The smaller the leak, the greater pressure required

5 The recommended procedure for finding leaks from a compressor is with an electronic leak detector. Checking joints with soapsuds is satisfactory only for locating large leaks, or pinpointing small leaks once a general area has been located.

6 Once leak checking is complete, remove the refrigerant/nitrogen vapor from the compressor.

7 If no leaks are found the compressor is ready for evacuation. (Skip to Step 10)

8 If any leaks are found they must be repaired before proceeding.

9 Repeat steps 4 thru 9 as necessary.

10 Disconnect the nitrogen cylinder. Evacuate the compressor after all leaks are repaired. (Refer to Section 8.6.4.)

8.6.4 Evacuation And Dehydration

Moisture is detrimental to refrigerant systems. The presence of moisture in a refrigeration system can have many undesirable effects such as: copper plating, acid sludge formation, “freeze-up” of the expansion valves, and formation of acids, resulting in metal corrosion. Proper evacuation of the system will remove any moisture from inside the system.

NOTES

1. Essential tools to properly evacuate any system include a good vacuum pump (5 cfm/8m3H volume displacement, Carrier Transicold part number 07-00176-11) and a good vacuum indicator such as a thermocouple vacuum gauge (micrometer). (Carrier Transicold part number 07-00414-00)

2. The use of a compound gauge is not recommended for use in determining when the evacuation process is completed because of its inherent inaccuracy.

3. Standard service hoses are not recommended for evacuation purposes. Evacuation hoses are recommended for this procedure.

a. Evacuation of the Complete System

1. Evacuate only after pressure leak check. (Refer to Section 8.6.3.)
2. If possible keep the temperature of the major components (condenser, evaporator, compressor and receiver) above 60°F (15.6°C) to speed evaporation of moisture. If the temperature is lower than 60°F (15.6°C), ice might form before moisture removal is complete. Heat lamps, heat guns or alternate sources of heat may be used to raise system temperature.
3. The recommended method to evacuate the system is to connect three evacuation hoses with vacuum pump and vacuum indicator (see Figure 8–18).
4. Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the evacuation and dehydration procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.
5. Backseat (turn counter-clockwise) the liquid line service valve, suction service and discharge service valves.
6. With the unit service valves closed (back seated) and the vacuum pump and vacuum indicator valves open, start the pump and draw a deep vacuum. Shut off the pump and check to see if the vacuum holds. This operation is to test the evacuation setup for leaks. Repair if necessary.
7. Midseat the refrigerant system service valves. Ensure that the MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE”.
8. Start the vacuum pump. Evacuate unit until the vacuum indicator indicates 2000 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to ensure the vacuum holds.
9. Break the vacuum with dry nitrogen through the discharge service valve. Raise system pressure to approximately 2 psig (0.1 bar). Ensure that the microprocessor does not switch to the charge mode. If this

occurs, switch it back to the “RECOVER/LEAK CHK/ EVAC MODE” (Refer to Section 5.2.3)

10. Purge nitrogen from system at the suction service valve.

11. Open the vacuum pump valve and start the pump. Evacuate unit to 500 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds below 2000 microns.

12. If vacuum holds below 2000 microns continue to step 14. If vacuum rises above 2000 microns continue to step 13.

13. Repeat steps 8 through 11 until the vacuum stays below 2000 microns.

14. Once the system holds a good vacuum, it is ready to be charged with refrigerant. Refer to Section 8.6.2.

b. Evacuation of the Low Side

1. Evacuate only after a low side pressure leak check. (Refer to Section 8.6.3)

2. If possible keep the temperature of the major components (condenser, evaporator, compressor and receiver) above 60°F (15.6°C) to speed evaporation of moisture. If the temperature is lower than 60°F (15.6°C), ice might form before moisture removal is complete. Heat lamps, heat guns or alternate sources of heat may be used to raise system temperature.

3. The recommended method to evacuate the system is to connect three evacuation hoses with vacuum pump and vacuum indicator (see Figure 8–18).

4. Ensure that the microprocessor MessageCenter displays “RECOVER/LEAK CHK/EVAC MODE” during the evacuation and dehydration procedures. (Refer to Section 5.2.3.) If the microprocessor switches to charge mode during the process, switch it back to the “RECOVER/LEAK CHK/EVAC MODE”.

5. Leave the liquid line service valve and the discharge service valve frontseated and then midseat the suction service valve.

6. Start the vacuum pump. Evacuate unit until the electronic vacuum gauge indicates 2000 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds.

7. Break the vacuum with dry nitrogen through the liquid line service valve. Raise system pressure to approximately 2 psig (0.1 bar). Ensure that the microprocessor does not switch to the Charge Mode. If this occurs, switch it back to the “RECOVER/LEAK CHK/EVAC MODE” (Refer to Section 5.2.3

8. Purge nitrogen from the low side of the system at the suction service valve.

9. Open the vacuum pump valve and start the pump. Evacuate unit to 500 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds below 2000 microns.

10. If vacuum holds below 2000 microns continue to step 12. If vacuum rises above 2000 microns continue to step 11.

11. Repeat steps 6 through 9 until the vacuum stays below 2000 microns.

12. Once the system holds a good vacuum, open the compressor discharge service valve and the liquid line service valve.

13. Start unit and check the refrigerant charge. Refer to Section 8.6.2.

c. Evacuation of the Compressor

1. Evacuate only after a compressor pressure leak check. (Refer to Section 8.6.3.)

2 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

3. If possible keep the temperature of the compressor above 60°F (15.6°C) to speed evaporation of moisture. If the temperature is lower than 60°F (15.6°C), ice might form before moisture removal is complete. Heat lamps, heat guns or alternate sources of heat may be used to raise compressor temperature.

4. Connect evacuation equipment to the compressor suction and discharge service valves. See Figure 8–18.

5. Start the vacuum pump. Evacuate compressor to 500 microns. Close the vacuum pump valve and shut off the pump. Wait a few minutes to be sure the vacuum holds. This checks for residual moisture and/or leaks.

6. Once the compressor holds a good vacuum, open the compressor suction and discharge service valve to allow refrigerant to enter the compressor.

7. Start unit and check the refrigerant charge. Refer to Section 8.6.2.

8.7 COMPRESSOR AND UNLOADER SERVICE

8.7.1 Repair or Replacement Determination

Certain operating conditions or refrigeration system components may be misdiagnosed and subsequently lead to the determination that the compressor requires replacement. These conditions or components should be checked prior to replacing a compressor and after a replacement compressor is installed to prevent replacement compressor damage. To determine if compressor replacement or repair is required, do the following:

a. If the compressor is operational, check the refrigerant charge, refer to Section 8.6.2.

b. If the compressor is operational, check operation of the unloaders, refer to Section 8.7.6.

c. If the compressor is operational, check the system components as follows:

1. Install gauges to allow reading of receiver, suction and discharge pressure. See Figure 8–18.

2. Start the unit in cooling so that compressor operates.

3. Frontseat the liquid line service valve. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar).
4. Monitor the gauges. If the receiver pressure drops rapidly and the suction and discharge pressures rise rapidly the liquid line service valve requires replacement before the compressor can be further tested.
5. Backseat the liquid line service valve and restart the unit. Slowly frontseat the suction service valve. Shut down the unit when the suction pressure drops to 2 psig (0.2 bar).
6. Monitor the gauges. If the suction and discharge pressures do not equalize rapidly, the compressor is not at fault.

d. Check condition of and repair cylinder heads and valve plates. Refer to Section 8.7.3.

8.7.2 Removal and Replacement of Compressor

a. Pumpdown the compressor. (Refer to Section 8.6.2.)

b. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

⚠ WARNING

Do not unscrew service valve mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.

c. Loosen the suction and discharge service valve mounting bolts. Tap the valve bodies to break the seal and then remove bolts.

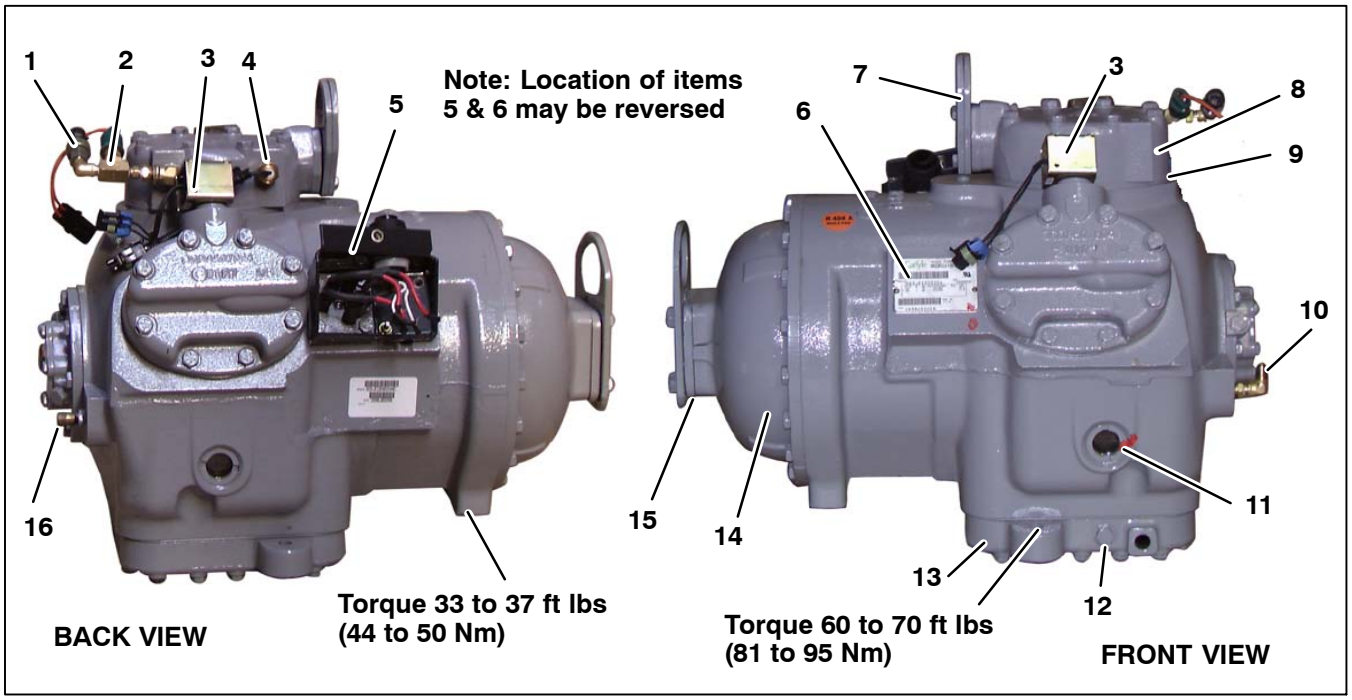
d. Locate the compressor junction box, item 5, Figure 8–19. Note location if the power wires on the terminal plate then remove wiring and compressor junction box. Disconnect all low voltage connectors.

e. Remove compressor mounting bolts.

f. Remove compressor. Refer to Section 2.9 for weight of compressor.

g. Draw a small sample of compressor oil and test for acidity If acid is present a system cleanup may be necessary.

h. Remove all external compressor components such as: the unloader coils; discharge strainer; switches, transducers, temperature sensors & fittings.



1. Compressor Discharge Pressure Transducer
2. High Pressure Switch
3. Unloader Coil
4. Compressor Discharge Temperature Sensor
5. Junction Box
6. Serial/Model Plate
7. Discharge Service Valve Flange
8. Cylinder Head
9. Valve Plate
10. Suction Pressure Transducer (Location)
11. Oil Level Sight Glass
12. Oil Drain Location
13. Oil Pan
14. Motor End Cover
15. Suction Service Valve Flange
16. Oil Fill Port

Figure 8–19 Compressor - model 06D

⚠ WARNING

Do not unscrew replacement compressor lifting eyelet/blankoff plate mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.

i. Loosen the suction and discharge lifting eyelet/ blankoff plate mounting bolts. Tap the center of the blankoff plates to break the seal and then remove bolts, plates and gaskets.

j. If required add oil to the replacement compressor. Add only 7.0 pints (3.3 liters) of oil when first adding oil to the compressor. This procedure is designed to compensate for excess oil that may have migrated with refrigerant to other parts of the system during unit operation.

k. Install components removed in step h. Install blankoff plates and plugs in original compressor for shipment.

l. Remove any remaining old gasket material from the discharge and suction service valve sealing surfaces.

m. Secure junction box to compressor.

n. Install compressor in unit. See Figure 8–19 for mounting bolt torque information.

o. Connect all wiring per wiring schematic. Install junction box cover.

p. Install new gaskets and mounting bolts in service valves. Torque discharge service valve mounting bolts 20 to 30 ft lbs (27 to 40.7 Nm). Torque suction service valve mounting bolts 55 to 80 ft lbs (74 to 108 Nm).

q. Leak check and evacuate the compressor. Refer to Section 8.6.3 and Section 8.6.4.

8.7.3 Cylinder Head and Valve Plate Service

a. Pumpdown the compressor. (Refer to Section 8.6.2.)

b. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

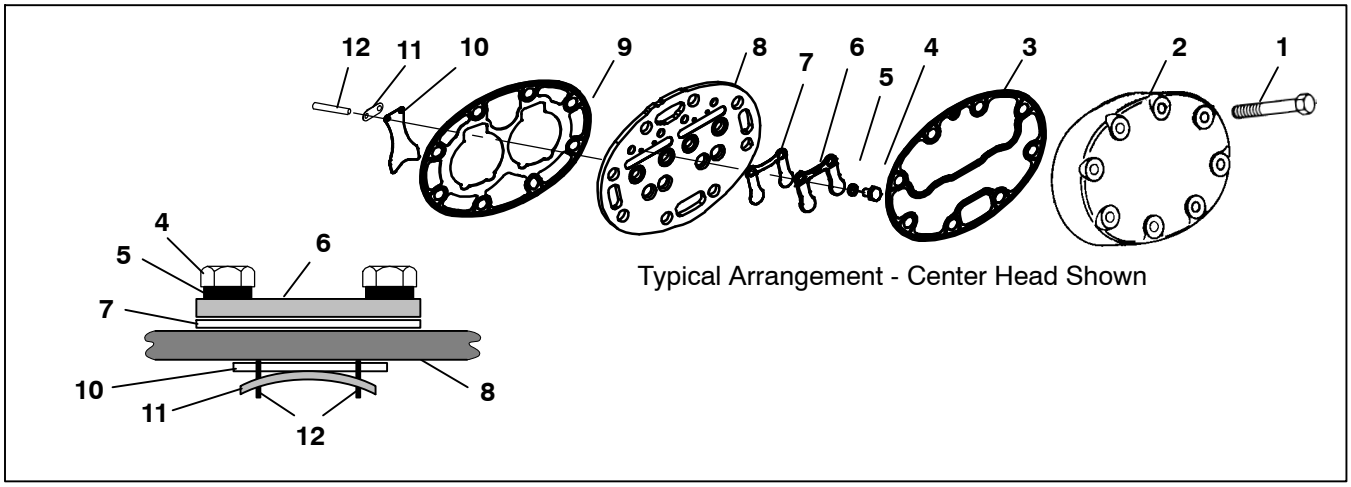
⚠ WARNING

Do not unscrew cylinder head mounting capscrews all the way before breaking seal. Entrapped pressure could result in injury.

c. Loosen cylinder head capscrews. Tap the head lightly with a wooden or lead mallet to break the seal and relieve any remaining pressure. Be careful not to drop the head or damage the gasket sealing surface. Remove cylinder head capscrews and gasket. (See Figure 8–20)

d. If removing the center head, remove the discharge valve mounting hardware.

e. If required, free the valve plates from the cylinder deck by using the discharge valve capscrews, without washers, as jackscrews through the outermost tapped holes in the valve plate after the valve stops and valves have been removed. Remove the valve plate gasket.



Typical Arrangement - Center Head Shown

1. Capscrew
2. Cylinder Head
3. Cylinder Head Gasket
4. Capscrew
5. Lockwasher
6. Discharge Valve Backer
7. Discharge Valve
8. Valve Plate
9. Valve Plate Gasket
10. Suction Valve
11. Suction Valve Spring
12. Dowel Pin

Figure 8–20 Cylinder Head & Valve Plate

f. Inspect the parts of the cylinder head and/or the valve plate.

1. Inspect cylinder head gaskets for proper alignment and center web blow-out.

2. Inspect the discharge valves for loose or damaged valve stops, or any debris that may affect the proper operation of the valves.

3. Inspect for broken, cracked, or chipped discharge valves.

4. Inspect the side valve plate discharge check valves to ensure the pistons move and contact the plates.

5. Inspect for broken, cracked, or chipped suction valves.

6. Inspect the valve plate and the cylinder head for cracks.

7. Inspect valve plate gaskets for damage and wear.

8. Remove any oil on top of the pistons. Inspect the top of the piston for damage. Check for debris, burned and carbonized oil sludge, or mechanical failure.

9. Inspect cylinder bores for excessive wear. Excessive wear for cylinder bores is defined as heavy and uneven scratches, gouges, or chipping of the internal wall of the cylinder, with a depth greater than 0.025 inch, which are caused by foreign objects, other than a normal reciprocating movement of the pistons and piston rings. If cylinder(s) are damaged, compressor replacement is required.

g. Discard valves and gaskets. Use only new valves and gaskets when assembling cylinder head and valve plate assemblies.

h. If required, install the discharge valves and discharge valve stops with capscrews and lock washers onto the valve plates. Torque the capscrews to 12 to 16 ft lbs (16.3 to 21.7 Nm).

i. Turn the valve plate over.

j. Install the suction valve spring on the dowel pins with the spring ends bearing away from the cylinder head. (See Figure 8–20)

k. Place suction valve on dowel pins.

l. Place the valve plate and new valve plate gasket (with flat side toward cylinder deck) on cylinder deck, ensuring that the valve plate is properly positioned on the four dowel pins.

m. Using a small screwdriver, operate the suction valves to ensure that the valve tips are not being held by the valve plate gasket. (See Figure 8–21)

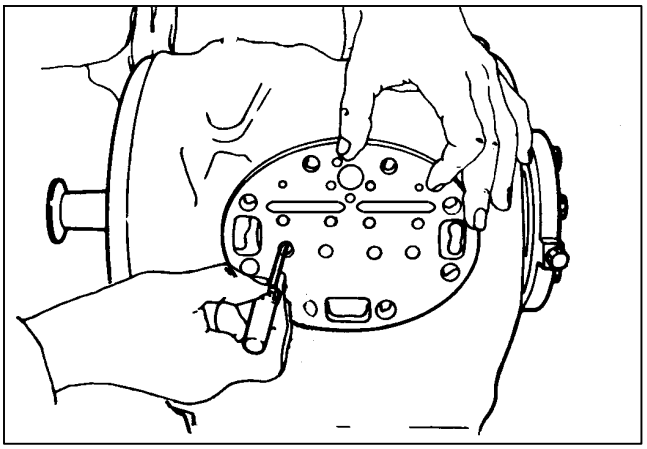


Figure 8–21 Checking Suction Valve

n. Install capscrews, cylinder head and new cylinder head gasket (with flat side toward valve plate), ensuring that the gasket and cylinder head are properly positioned on the valve plate. Torque the capscrews, in a diagonal pattern, 42 to 55 ft-lbs (57 to 74 Nm)

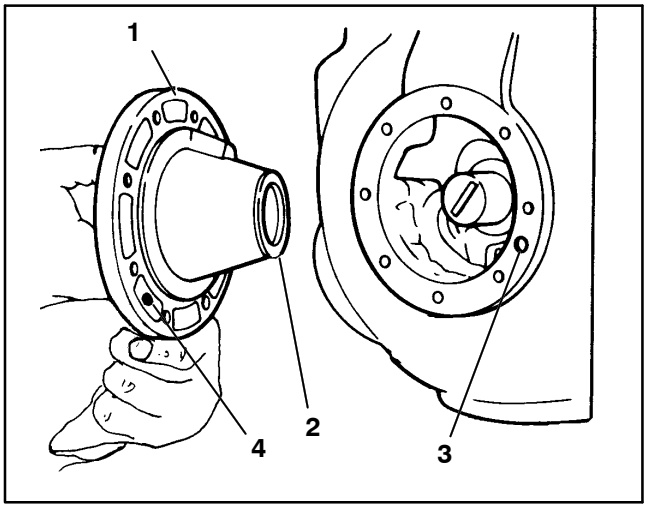
o. Leak check and evacuate the compressor. Refer to Section 8.6.3 and Section 8.6.4.

8.7.4 Oil Pump And Bearing Head

a. Pumpdown the compressor. (Refer to Section 8.6.2.)

b. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle. the high voltage source.

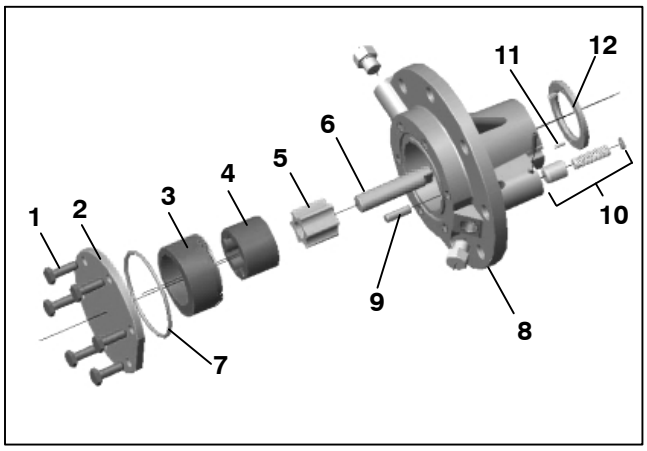
c. Loosen the eight capscrews, tap the pump to relieve any remaining pressure and then remove the oil pump bearing head assembly, gasket and thrust washer. (See Figure 8–22.)



1. Oil Pump & Bearing Head
2. Thrust Washer
3. Oil Pickup Tube
4. Oil Inlet Port

Figure 8–22 Oil Pump and Bearing Head Assembly

d. If it is determined that the oil pump is not operating properly, the entire oil pump and bearing head assembly must be replaced. Replacement parts for the pump are not available except for the cover plate O-ring. However, in the event the pump requires inspection or cleaning, refer to Figure 8–23 for disassembly and reassembly. Clean all parts; coat all moving parts with compressor oil before proceeding with reassembly.



1	Capscrews	7	O-Ring
2	Cover	8	Oil Pump & Bearing
3	Eccentric Ring	9	Dowel Pin
4	Rotor	10	Relief Valve Assembly
5	Idler	11	Pins (2)
6	Shaft (Drive)	12	Thrust Washer

Figure 8–23 Oil Pump

e. Install the pump end thrust washer on the two dowel pins located on the bearing head. (See Figure 8–22.)

⚠ CAUTION

Ensure that thrust washer does not fall off dowel pins while installing oil pump.

f. Install the bearing head assembly with a new gasket on the compressor crankshaft. Carefully push oil pump on by hand ensuring that the thrust washer remains on the dowel pins, the tang on the end of the drive engages the slot in the crankshaft, and the oil inlet port on the pump is aligned with the oil pickup tube in the crankcase. The oil pump should mount flush with the crankcase with the word **"TOP"** stamp on the pump oriented straight up.

g. Align the gasket and install the eight capscrews in the mounting flange. Torque capscrews, in a diagonal pattern, 30 to 50 ft-lbs (40.7 to 87 Nm).

h. Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

8.7.5 Compressor Oil Level

a. Checking Compressor Oil Level

⚠ CAUTION

An overcharge of oil will reduce system capacity and possibly cause internal compressor damage.

1 Operate the unit in Cool Mode for at least 20 minutes.

2 Check the oil sight glass to ensure that no foaming of the oil is present after 20 minutes of operation. If the oil is foaming excessively after 20 minutes of operation, check the refrigerant system for flood-back of liquid refrigerant. Correct this situation before performing step 3

3 Turn unit off to check the oil level. The correct oil level range should be 1/8 to 1/2 glass. If level is above 1/2 glass or below 1/8 glass, continue with the following steps as required.

b. Adding Oil With Compressor In System

⚠ CAUTION

Use only Carrier Transicold approved Polyol Ester Oil (POE). Buy quantities of one gallon or less. When using this hygroscopic oil, immediately reseal. Do not leave container of oil open or contamination will occur.

Two methods for adding oil are the oil pump method and closed system method.

Oil Pump Method

One compressor oil pump that may be purchased is a Robinair, part no. 14388. This oil pump adapts to a one U.S. gallon (3.785 liters) metal refrigeration oil container and pumps 2-1/2 ounces (0.0725 liters) per stroke when connected to the oil fill (Item 12, Figure 8–19). There is no need to remove pump from can after each use.

When the compressor is in operation, the pump check valve prevents the loss of refrigerant, while allowing the technician to develop sufficient pressure to overcome the operating suction pressure to add oil as necessary.

Backseat suction service valve and connect oil charging hose to oil fill. Purge the oil hose at oil pump. Add oil as necessary.

Closed System Method

⚠ CAUTION

Extreme care must be taken to ensure the hose is immersed in the oil at all times. Otherwise air and moisture will be drawn into the compressor.

In an emergency where an oil pump is not available, oil may be drawn into the compressor through the suction service valve.

1. Pump down the compressor. Refer to Section 8.6.2.
2. With both manifold gauge set valves frontseated, leave the suction connection connected to the com-

pressor suction service valve port and connect the common connection to a vacuum pump. Remove the discharge hose from the manifold gauge set; connect the end with the Schrader depressor to the compressor oil fill port (Item 12, Figure 8–19), and immerse the other end in a container of refrigeration oil. Start the vacuum pump throttle the manifold gauge set suction valve and pull a vacuum on the compressor while watching the the oil level in the glass. Fill to 1/4 glass. Shut down pump and remove oil fill line from the oil fill port.

3. Break any remaining vacuum (raise to 0 psig/bar) with refrigerant remaining in the system (crack open the suction service valve), or from a fresh cylinder of refrigerant. Evacuate the compressor crankcase to 500 microns. Remove service equipment, backseat suction and discharge service valves and recheck oil level.

c. Removing Oil From The Compressor

1. Check compressor oil level, refer to preceding step a. If the oil level is above the middle of the sight glass (item 11, Figure 8–19), oil must be removed from the compressor.

2. Pump down the compressor. Refer to Section 8.6.2.

3. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

4. Loosen the oil drain plug (item 10, Figure 8–19) and allow oil to seep out and bring the level to 1/8 glass. Tighten the plug securely back into the compressor.

5. Leak check the oil drain plug, refer to Section 8.6.3. Start compressor and recheck oil level

8.7.6 Unloaders

a. Unloader Checkout procedure

1 Install a manifold gauge set on the compressor suction and discharge service valves and start unit in cooling with compartment temperatures at least 5°F (2.8°C) below set point. The compressor will be fully loaded (both unloader coils de-energized). Note suction pressure.

2 Unplug both unloader coils.

3 Using cable included in the test kit (Carrier Transicold part number 07-50006-00), energize the front unloader (UL1). Note discharge and suction pressures. A rise of approximately 3 psig (0.2 bar) will be noted on the suction pressure gauge. Discharge pressure should drop approximately 5 to 15 psig (0.4 to 1.0 bar).

4 Disconnect UL1 and note pressures. Suction pressure should drop and discharge pressure should rise by same amount as in step 3 above.

5 Repeat steps 3 & 4 for the rear unloader (UL2). At the end of the test, reconnect both unloaders.

NOTE

If pressures do not change as indicated, check the unloader coil resistance (refer to Section 2.12). Replace if coil is open or shorted. If either unloader coil energizes and the suction and discharge pressures do not change, the unloader assembly must be checked.

b. Unloader Coil Replacement

NOTE

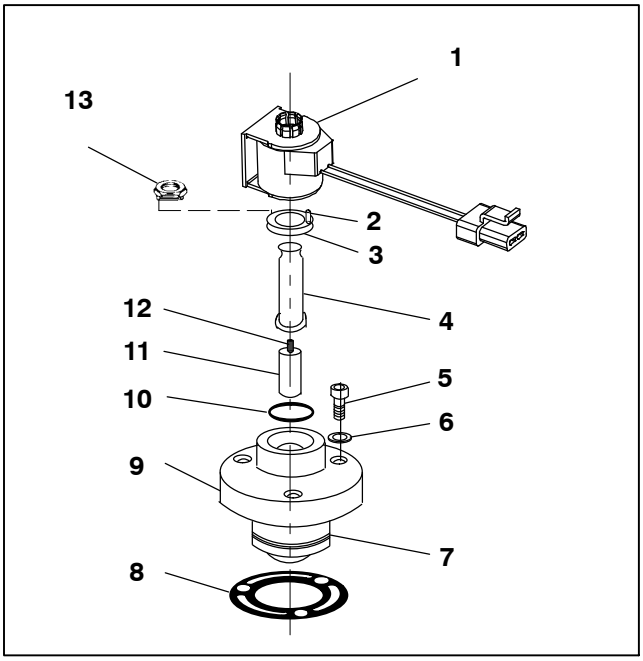
The coil may be removed while the compressor is under pressure.

1. Disconnect leads and lift coil (see Figure 8–24) off enclosing tube.

2. Verify replacement coil is the correct type, voltage and frequency.

3. Place new coil over enclosing tube. With wiring facing in the desired direction, ensure roll pin is fitted in one of the detents in the bottom of the coil mounting. Coll is to snap into place with bottom in contact with the enclosing tube nut. Connect wiring.

4. Check operation, refer to preceding step a.



1. Coil Assembly
2. Pin, Roll
3. Enclosing Tube Nut
4. Enclosing Tube
5. Bolts, Valve Body (3)
6. Washers (3)
7. Piston
8. Gasket
9. Valve Body
10. “O” Ring
11. Plunger
12. Plunger Spring
13 Installation/Removal Tool

Figure 8–24 Unloader Coil

c. Replacing Unloader Valve Internal Parts

1. Pump down the compressor. Refer to Section 8.6.2 step e.

2 Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

3. Disconnect and remove coil.

⚠ WARNING

Do not unscrew unloader enclosing tube nut all the way before breaking seal. Entrapped pressure could result in injury.

4 Loosen the enclosing tube nut (see Figure 8–24) using installation/removal tool supplied with repair kit. Ensure tube is loose and seal is broken then remove tool, enclosing tube nut, enclosing tube, plunger with plunger spring and o-ring

5. Check plunger for restriction due to: (a) corroded or worn parts; (b) foreign material lodged in valve; (c) bent or dented enclosing tube.

6. Install new parts. Do not over tighten enclosing tube assembly. Torque to a 100 inch pounds (11.3 Nm).

7. Remove tool and install coil, refer to preceding step b.

8 Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

9. Check operation, refer to preceding step a.

d. Unloader Valve Replacement

1. Pump down the compressor. Refer to Section 8.6.2.

2. Disconnect and remove coil.

⚠ WARNING

Do not unscrew unloader valve body mounting bolts all the way before breaking seal. Entrapped pressure could result in injury.

3 Loosen the valve body mounting bolts. Tap the valve body to break the seal and then remove bolts and gasket.

4. Remove small screen from inside the compressor head and ensure it is not obstructed. Clean or replace as required.

5. Place new gasket onto replacement unloader valve body (with flat side toward the head) and, using unloader ring pliers (Carrier Transicold part number 07-00223-00) compress the unloader ring while inserting the unloader into the compressor head.

6. One valve body mounting hole is offset to assist in correctly aligning the valve body and gasket. Insert mounting bolts, align with gasket holes and mounting holes in head. Start bolts by hand and then toque mounting bolts 12 to16 ft-lbs (1.3 to 1.8 Nm).

7 Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

8. Check operation, refer to preceding step a.

8.8 REFRIGERANT SYSTEM COMPONENT SERVICE

8.8.1 Evaporator Coil

The use of recycled cardboard cartons is increasing across the country. The recycled cardboard cartons create much more fiber dust during transport than “new” cartons. The fiber dust and particles are drawn into the evaporator where they lodge between the coil fins. If the coil is not cleaned on a regular basis, sometimes as often as after each trip, the accumulation can be great enough to restrict air flow, cause coil icing, repetitive defrosts and loss of unit capacity. Due to the “washing” action of normal defrost the fiber dust and particles may not be visible on the face of the coil but may accumulate deep within.

Clean the evaporator coil on a regular basis, not only to remove cardboard dust, but to remove any grease or oil film which sometimes coats the fins and prevents water from draining into the drain pan.

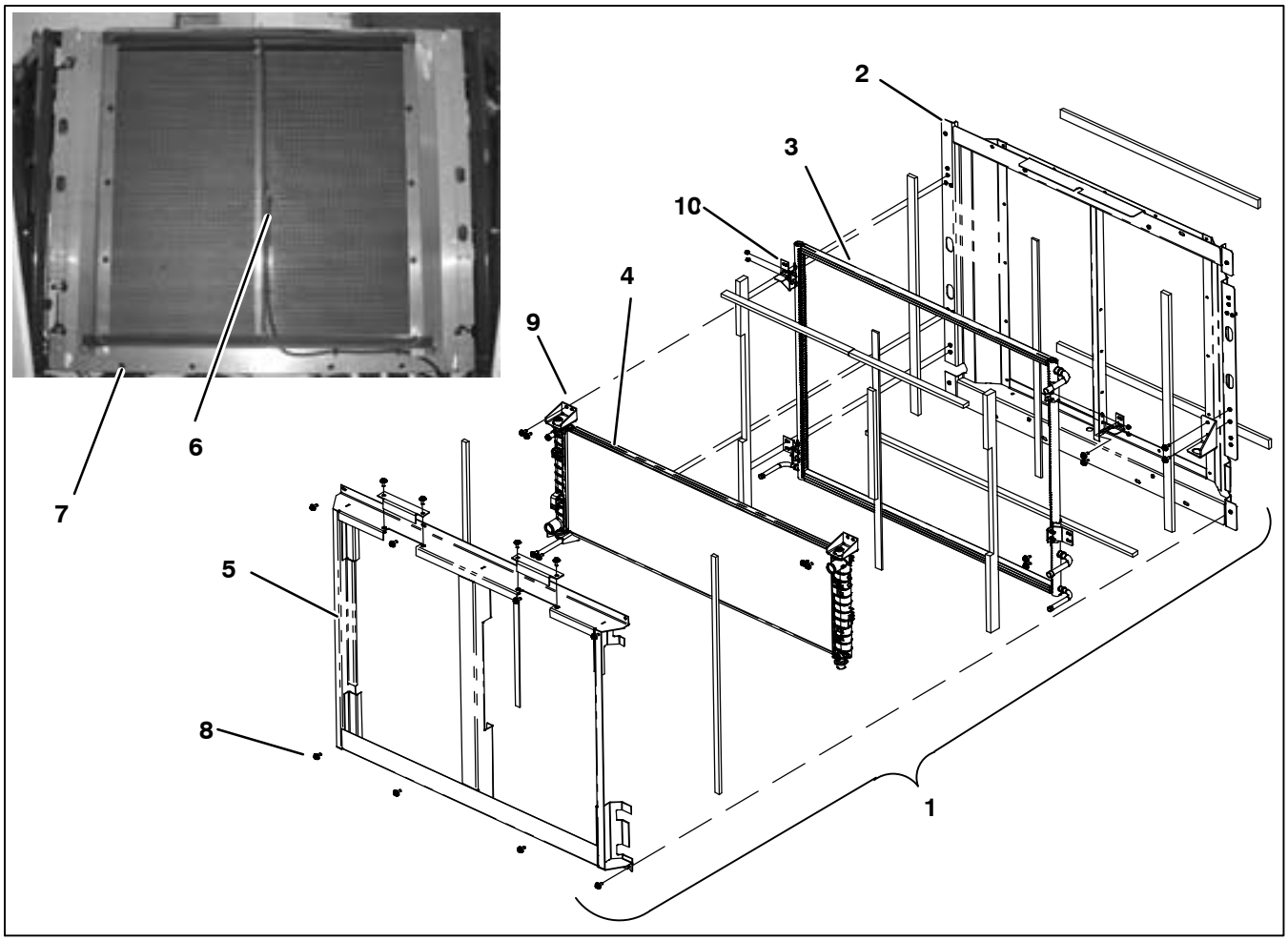
Cardboard fiber particles after being wetted and dried several times can be very hard to remove. Therefore, several washings may be necessary.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove rubber check valves (Kazoo) from drain lines of the evaporator to be cleaned.

c. Spray coil(s) with a mild detergent solution such as Oakite 164 or 202) or any good commercial grade automatic dish washer detergent such as Electrosol or Cascade and let the solution stand for a few minutes and reverse flush (opposite normal air flow) with clean water at mild pressure. A garden hose with spray nozzle is usually sufficient. Make sure drain lines are clean.

d. Re-install check valves and run unit until defrost mode can be initiated to check for proper draining from drain pan.



1. Condenser/Radiator Assembly
2. Condenser Frame
3. Condenser Coil
4. Radiator
5. Radiator Frame
6. Ambient Air Temperature Sensor (ATT)
7. Condenser/Radiator Assembly Mounting Bolts
8. Radiator Frame Mounting Bolts
9. Radiator Mounting Brackets
10. Condenser Coil Mounting Brackets

Figure 8–25 Condenser/Radiator Assembly

8.8.2 Condenser Coil

a. Cleaning

Note

Only Clean Water Should Be Used To Wash The Condenser. Do Not Use Any Detergents To Clean The Condenser.

Remove all foreign material from the condenser coil by reversing the normal air flow. (Air is pulled in through the front and discharges over the engine.) Compressed air or water may be used as a cleaning agent. Take care so that the fins aren't bent during this procedure.

b. Condenser Coil Replacement

Note

If the condenser coil (Item 3, Figure 8–25) requires replacement, the entire condenser/radiator assembly (1) must be removed from the unit and disassembled/reassembled on the bench.

1. Remove the refrigerant charge. Refer to Section 8.6.2.
2. Drain coolant completely by removing radiator cap and then the lower radiator hose.
3. Remove the surround with the grille attached. Refer to Section 8.4.2.
4. Remove hoses from radiator.
5. Unsolder refrigerant lines from condenser coil.
6. Disconnect the hail and bug screen sufficient to reach the ambient sensor (6) and wiring. Remove sensor and wiring from radiator frame (5).
7. Remove the eight bolts (7) securing the condenser/radiator assembly to the unit.
8. Remove the condenser/radiator assembly from the unit.
9. Remove the eight bolts (8) securing the radiator frame to the condenser frame (2) and set radiator frame aside.

10. Separate the radiator (4) from the condenser/radiator assembly by removing the top and bottom radiator mounting brackets (9). Set radiator aside.
11. Remove condenser coil by removing the condenser coil mounting brackets (10).
12. Reassemble condenser/radiator assembly in reverse order using new coil.

⚠ CAUTION

Do not bend the copper tubing on the condenser coil when installing the new condenser. Bend the unit tubing if tubes do not align correctly.

Note

Before applying heat to the new condenser apply a wet rag to the entire copper to aluminum transition area to avoid melting the protective heat shrink or damaging the joint.

13. Reassemble condenser/radiator assembly into unit.
14. Leak check, evacuate and charge the system. Refer to Sections 8.6.3, 8.6.4 & 8.6.2.
15. Refill engine coolant. Refer to Section 8.5.12.

8.8.3 Filter-Drier

a. Check Filter-Drier

The unit must be running in cool for this test. check for a restricted or plugged filter-drier by feeling the liquid line inlet and outlet connections of the drier cartridge. if the outlet side feels cooler than the inlet side, then the filter-drier should be replaced.

b. Replace Filter-Drier

1. Pump down the low side, refer to Section 8.6.2.
2. Remove bracket, loosen the inlet connection to relieve any remaining pressure then remove drier.
3. Procure new O-rings. Lubricate the O-rings, back side of sleeves and coupling nuts. Using a backup wrench at each connection torque 30 to 38 ft-lbs (41 to 51 Nm).
4. Leak check and evacuate the low side of the system. Refer to Sections 8.6.3 & 8.6.4.

8.8.4 Replacing Receiver Sight Glass Or Fusible Plug

a. Remove the refrigerant charge. Refer to Section 8.6.2.

b. Loosen the sight glass or fusible plug to relieve any remaining pressure. Remove and discard glass or plug.

c. Wrap threads of new sight glass or plug with Teflon tape or spread sealing compound on pipe threads and install. Torque the sight glass to 15 to 25 ft lbs (20 to 34 Nm). Torque the fusible plug to 4 to 8 ft lbs (5 to 11 Nm).

d. Leak check, evacuate and charge the system. Refer to Sections 8.6.3, 8.6.4 & 8.6.2.

8.8.5 Compressor Suction Modulation Valve (CSMV)

The purpose of the SMV is to maintain the compressor within its operating envelope and maximize unit capacity and fuel economy.

At initial startup, the microprocessor will go through a self test. When the test is complete, the MessageCenter will display “SMV CLOSING”. Then the MessageCenter will display “SETTING SMV XX%” with actual percentage depending on ambient temperature and refrigerated compartment temperature. The unit will then go through its normal start procedure.

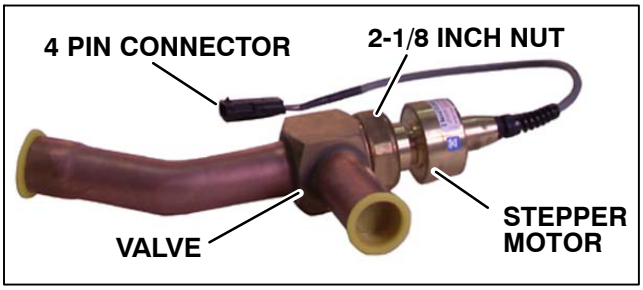


Figure 8–26 Suction modulation valve (CSMV)

If it is suspected that the SMV is malfunctioning, the most efficient method of diagnosing the valve is to run a Pretrip (refer to Section 3.4). The Pretrip steps will check the remainder of the system and the #11 test will check the SMV. The valve will be brought to a preset position, the unit started and then the valve will be opened while the microprocessor monitors suction pressure. If there is a problem with the valve, stepper motor or microprocessor wiring to the valve the test will fail.

a. Diagnostics - Microprocessor or Wiring

1. Locate the wires, on the engine harness side of the SMV connector labeled CSMVA, CSMVB, CSMVC and CSMVD. These will correlate to the connector pins labeled A, B, C and D. Refer to Table 8–3.

Table 8–3 CSMV Connections

Connector Pin	Wire Color	Winding/Pole
A	BLACK	1A
B	WHITE	1B
C	RED	2B
D	GREEN	2A

2. Power the microprocessor by toggling the Main Power switch out of the OFF position DO NOT ALLOW THE UNIT TO START. When the MessageCenter displays “SMV CLOSING”, measure the AC voltage between pins A & B and then between C & D. A voltage (10 to 16 VAC) should be read by the digital voltmeter for each pair of wires. If the reading is present on the wire pairs there is a good signal coming from the microprocessor.
3. If the reading is not present on one or more of the wire pairs, check the wiring between the micropro-

cessor and the SMV connector, or check the microprocessor for proper model number Configuration.

b. Diagnostics - Stepper Motor

The valve stepper motor may be tested using a stepper motor drive tester or ohmmeter.

1. To test with a stepper motor drive tester (Carrier Transicold part number 07-00375-00), connect the 4 pin test cable to the valve connector, refer to Table 8–3, and the cable wires to the tester in accordance with wire and terminal color.

2. Set the step rate to 200 steps per second and either open or close the valve. Each red LED should light sequentially until all four are illuminated. Any LED failing to illuminate indicates an open on that leg and a need to replace the piston and drive motor assembly .

3. To test with an ohmmeter, check the winding resistance between connector pin 1A & 1B and then between 2A & 2B, see Figure 8–27. In normal ambient, the resistance between the pins should be 72 to 84 ohms. Also check each terminal to the coil casing (ground). If an out of tolerance or zero reading is observed, the piston and drive motor assembly is to be replaced.

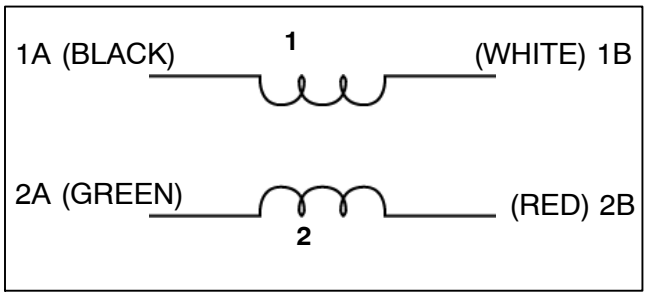


Figure 8–27 CSMV Coil

c. Diagnostics - Valve

NOTE

If the valve failed pretest and passed the preceding diagnostic testing, this is an indication that the valve internal mechanism is damaged and the piston and motor assembly is to be replaced.

1. To test the valve internal mechanism, install a manifold gauge set on the suction service valve and a stepper motor drive tester.

2. Start the unit, set the step rate to 200 steps per second and close the valve while watching the suction pressure. Within one minute the suction pressure should begin to fall. Place the Main Power switch in the OFF position before the reading enters a vacuum.

3. If the suction pressure does not change, this is an indication the valve is stuck and the piston and drive motor assembly is to be replaced.

d. Replacing the Drive and Motor Assembly

1. Pump down the low side. (Refer to section 8.6.2).

2. Remove valve piston and motor assembly and replace with a new assembly and gasket. The power head should be set to 100% open when received from the warehouse. This is to ensure the Teflon valve seal is not damaged when it is installed. Ensure the valve is fully open by using the stepper motor tester to manually open the valve to 100% before it is installed. Torque nut to 47.4 Nm (35 ft-lb).

3. Leak check, evacuate the low side. Refer to Sections 8.6.3 and 8.6.4.

e. Emergency Repair Procedures:

In the event that the SMV system has a failure, and replacement components are not readily available in an emergency. A **LIMP-HOME** procedure can be done as follows :

1. Install a manifold gauge set.

2. Pump down the low side. (Refer to section 8.6.2).

3. Remove SMV power head by loosening the 2-1/8 inch diameter nut (see Figure 8–26), and sliding the power head out.

4. Remove the piston by loosening the Allen screw and removing the piston and screw.

5. Install the power head assembly (without piston), torque to 35 to 40 ft-lb (47 to 54 Nm).

6. Leak check and evacuate the low side. Refer to Sections 8.6.3 & 8.6.4.

7. Start the unit.

8. Adjust the suction service valve so that the approximate temperature OR current limit is maintained. For perishable loads, it is recommended that the adjustment be made so that the available capacity is slightly larger than the load, the unit will cycle OFF and ON.

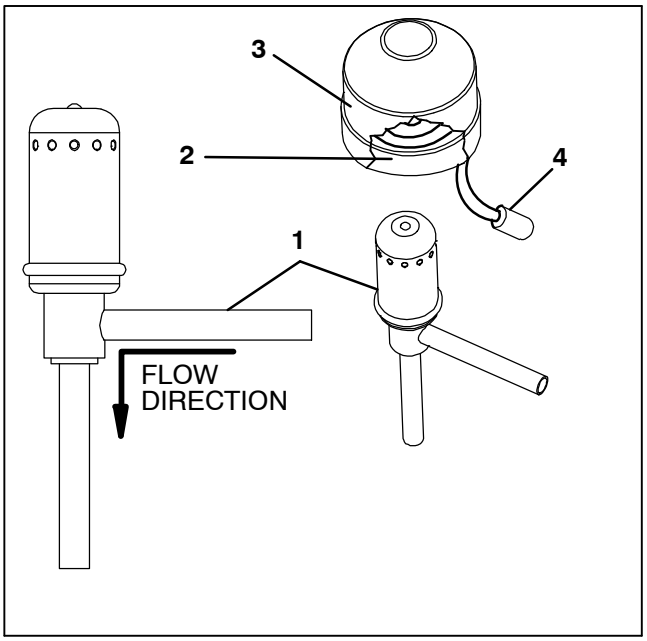
9. Once repair parts become available, repair as required.

8.8.6 Electronic Expansion Valve

The electronic expansion valve (EVXV - see Figure 8–28) is a microprocessor driven device which meters the flow of refrigerant into the coil. The flow control provides: (a) response to match the evaporator load and (b) prevention of liquid refrigerant return to the compressor. Unless the valve is defective, it seldom requires any maintenance.

NOTE

As a preliminary check, ensure the EVXV coil is snapped down fully, and the coil retention tab is properly seated in one of the valve body dimples.



1. Electronic Expansion Valve
2. Coil Boot
3. Coil
4. Five Pin Connector

Figure 8–28 Electronic expansion valve

a. Diagnostics - Microprocessor or Wiring

1. Locate the wires, on the engine harness side of the EVXV connector labeled EXVA, EXVB, EXVC, EXVD and EXVE. These will correlate to the connector pins labeled A, B, C, D and E. Refer to Table 8–4.

Table 8–4 EVXV Connections

Connector Pin	Wire Color	Winding
A	ORANGE	A
B	RED	B
C	YELLOW	$\overline{A}$
D	BLACK	$\overline{B}$
E	GREY	COM (+12V)

2. Set the voltmeter to the DCV scale. Ensure the unit is disconnected from standby power and start the unit in Standby Operation. Wait for the MessageCenter to display “UNIT SHUTDOWN - SEE ALARM LIST”.
3. Perform the following test on the wiring coming from the microprocessor:
   Place the positive (+) voltmeter lead on pin E, the negative (-) voltmeter lead on pin A and observe the meter for several seconds. The voltage reading will be very low, then rise to battery voltage (approximately 12.3VDC with a good battery) for a few seconds, then drop back to a lower reading
4. Repeat for pins B,C and D.
5. If there is no voltage reading or if the voltage never rises to battery voltage level, there is a problem in the wiring or the microprocessor. Test all wiring from the EVXV connector to the microprocessor and verify good continuity before replacing the microprocessor.

b. Diagnostics - Stepper Motor

The valve stepper motor may be tested using a stepper motor drive tester or ohmmeter.

1. To test with a stepper motor drive tester (Carrier Transicold part number 07-00375-00), connect the 5 pin test cable to the valve connector, and the cable wires to the tester in accordance with wire and terminal color. (if a 5 pin tester cable is required, order Carrier Transicold part number 07-00375-11.)
2. Set the step rate to 50 steps per second and either open or close the valve. Each red LED should light sequentially until all four are illuminated. Any LED failing to illuminate indicates an open on that leg and a need to replace the drive.
3. To test with an ohmmeter, check the winding resistance between connector pin A & E, B & E, C & E and then between D & E. In normal ambient, the resistance between the pins should be 46 ohms. If an infinite or zero reading is observed, the piston and drive motor assembly is to be replaced.

c. Diagnostics - Valve

NOTE

If the valve failed Pretrip and passed the preceding diagnostic testing, this is an indication that the valve internal mechanism is damaged and the piston and motor assembly is to be replaced.

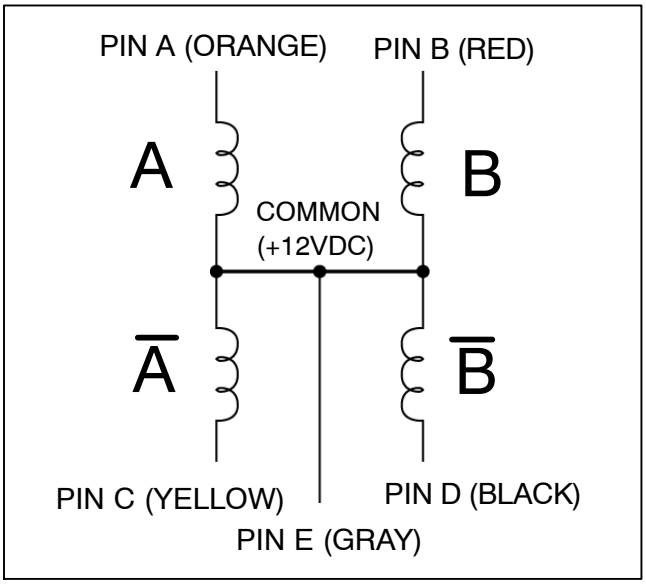


Figure 8–29 Electronic Expansion Valve

1. To test the valve internal mechanism, install a manifold gauge set on the suction service valve and a stepper motor drive tester. Refer to Section 8.8.6b.
2. Start the unit, set the step rate to 200 steps per second (refer to Section 8.8.6 step b.) and close the valve while watching the suction pressure. Within one minute the suction pressure should begin to fall.

3. If the suction pressure does not change, this is an indication the valve is stuck and the piston and drive motor assembly is to be replaced.

d. Replacing Expansion Valve & Screen

1. Pump down the low side. (Refer to section 8.6.2).
2. Remove coil and unbraze valve. Clean all tube stubs so new valve fits on easily.
3. Use a wet rag to keep the replacement valve cool and braze in place.
4. Leak check and evacuate the low side. Refer to Sections 8.6.3 and 8.6.4.

8.8.7 High Pressure Switch

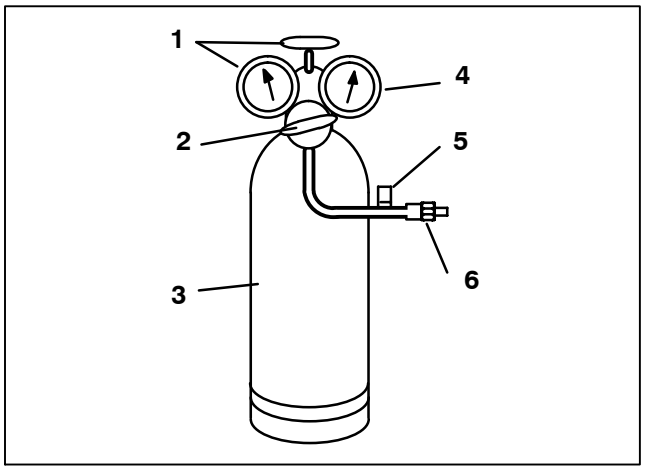
a. Replacing High Pressure Switch

1. Pump down the compressor (Refer to section 8.6.2).
2. Disconnect wiring from switch, and remove switch.
3. Install switch after verifying switch settings. (Refer to following step b.)
4. Leak check and evacuate the compressor. Refer to Sections 8.6.3 and 8.6.4.

b. Checking High Pressure Switch

⚠ WARNING

Do not use a nitrogen cylinder without a pressure regulator. Cylinder pressure is approximately 2350 PSIG (160 bar). Do not use oxygen in or near a refrigerant system as an explosion may occur. (See Figure 8–30.)



1. Cylinder Valve and Gauge
2. Pressure Regulator
3. Nitrogen Cylinder
4. Pressure Gauge 0 to 400 PSIG (0 to 27.2 bar)
5. Bleed-Off Valve
6. Switch

Figure 8–30 Typical Setup for Testing High Pressure Switch

1. Remove switch as outlined in preceding section
2. Connect ohmmeter or continuity light across switch terminals. Ohmmeter will indicate resistance and continuity light will be illuminated if switch closed after relieving pressure.
3. Connect switch to a cylinder of dry nitrogen. (See Figure 8–30)
4. Set nitrogen pressure regulator higher than open setting for switch being tested. For pressure switch settings refer to Section 2.10.
5. Close valve on cylinder and open bleed-off valve.
6. Open cylinder valve. Slowly close bleed-off valve and increase pressure until the switch opens. If light is used, light will go out and if an ohmmeter is used, the meter will indicate open. Close cylinder valve. Slowly open bleed-off valve (to decrease pressure) until switch closes (light will illuminate or ohmmeter will indicate open).

8.8.8 Pressure Transducers

The Compressor Discharge Pressure Transducer (CDP) has a range of 0 to 500 PSIG (0 to 34.0 bar) while the Compressor Suction Pressure Transducer (CSP) and Evaporator Pressure Transducer (EVOP) have a range of -14.7 to100 PSIG (-1 to 6.8 bar). To test the transducers, do the following:

NOTE

The Compressor Discharge Pressure on the microprocessor Data List will never read less than 0 bar/psig, even if it is exposed to a vacuum (such as when evacuating the system.) Also, the compressor suction pressure and evaporator pressure transducers will never read higher than 100 psig, even if the actual pressure is higher.

a. Verify that the wiring to the transducer is correct.

b. Power up the transducer circuit. Place the unit in PC mode, refer to Section 5.3. Check Voltage to transducer connector. Voltage reading between B (positive) and A (negative) should be 5.0 VDC.

c. To check the signal wiring, check continuity between the transducer connector C terminal and the following microprocessor connector:

CDP = 1MP05, CSP = 1MP29, EVOP = 1MP06

d. If voltage and signal wire are good, replace the transducer. The transducer may be removed by disconnecting the connector and quickly backing it off the Schrader valve fitting.

8.8.9 Defrost Air Switch

NOTE

If the DTT temperature is above 40°F (4.4°C) defrost cannot be initiated and the Message-Center will display “CANNOT START DEFROST CYCLE”.

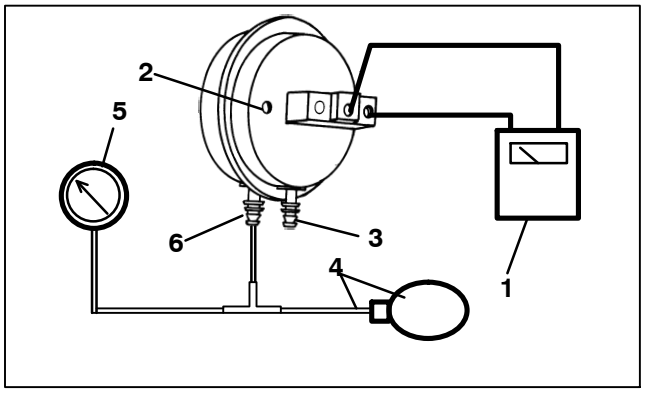
a. Check air switch tubing. Red tube is to be connected to the high connection and routed below the coil. Clear

tube is to be connected to the low connection and routed above coil. Check condition and mounting of air sensing fittings on the coil end of both tubes.

b. To check the defrost air switch, run unit in cooling and jumper across the air switch terminals. This will start the defrost cycle as it simulates the action of the defrost air switch. Bypassing the switch in this manner operates all components involved in defrost.

c. Unit should remain in defrost until the DTT reaches 55°F (12.8°C), for normal defrost, or after 5 to 10 minutes, for natural defrost (refer to Section 4.6 for more information on defrost). At this point the defrost cycle will terminate, and the unit will resume automatic operation.

d. If the above test indicates satisfactory operation, test DAS settings using a Magnehelic gauge (Carrier Transicold part number 07-00177) or similar instrument as follows.



1. Ohmmeter or Continuity Device
2. Adjustment Screw (0.050" socket head size)
3. Low Side Connection
4. Pressure Line or Aspirator Bulb (Carrier Transicold part number 07-00177-01)
5. Magnehelic Gauge (Carrier Transicold part number 07-00177-00)
6. High Side Connection

Figure 8–31 Defrost Air Switch Test Setup

e. Ensure magnehelic gauge is in proper calibration.

NOTE

The magnehelic gauge may be used in any position, but must be re-zeroed if position of gauge is changed from vertical to horizontal or vice versa. USE ONLY IN POSITION FOR WHICH IT IS ZEROED.

f. With air switch in vertical position, connect high pressure side of magnehelic gauge, a tee and and aspirator to high side connection of air switch. Tee is to be placed approximately half-way between gauge and air switch or an improper reading may result. (See Figure 8–31)

g. Attach an ohmmeter to the air switch electrical contacts to check switch action.

NOTE

Use a hand aspirator (Carrier Transicold part number 07-00177-01), since blowing into tube by mouth may cause an incorrect reading.

h. With the gauge reading at zero, apply air pressure very slowly to the air switch. An ohmmeter will indicate continuity when switch actuates. The switch contacts should close and the ohmmeter needle move rapidly to 0. Any hesitation in the ohmmeter indicates a possible problem with the switch, and it should be replaced.

i. Refer to Section 2.10 for switch setting. If switch fails to actuate at correct gauge reading, adjust switch by turning adjusting screw clockwise to increase setting or counterclockwise to decrease setting.

j. Repeat checkout procedure until switch actuates at correct gauge reading.

k. After switch is adjusted, place a small amount of paint or fingernail polish on the adjusting screw so that vibration will not change switch setting.

8.9 ELECTRICAL SYSTEM COMPONENT SERVICE

Procedures for servicing or maintaining the high voltage electrical system components are provided in the following sub-paragraphs.

8.9.1 Megohmmeter Test Procedure

This instruction will aid in the check of the electrical wiring insulation integrity and field electrical connections.

A megohmmeter test instrument (commonly known as a Megger) can be purchased locally at most electrical supply centers. This test requires a meter that can be set to 1000V.

⚠ CAUTION

Before connecting a megohmmeter, place the Main Power switch in the OFF position. Disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. Isolate the microprocessor by disconnecting all connectors and wires going to it. Observe National Electric Manufacturer's Association (NEMA) rules and test equipment manufacturers instructions.

a. Disconnect the generator ground wire (GEN-GRD = green wire marked with red tape) from the unit ground plate (PE plate) inside the control box. See Figure 8–32.

b. Connect a megohmmeter lead to the ground plate.

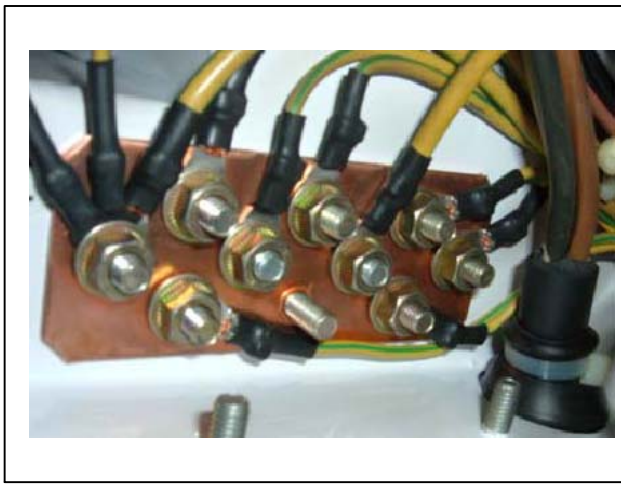


Figure 8–32 Megohmmeter Connection to Ground Plate

c. Connect the remaining lead to the red wire at the T1 terminal of power supply contactor 1 (PSCON) See Figure 8–33

d. Set the megohmmeter reading to 1000V.

e. Turn on the meter and record reading. It should be greater than 200 MΩ.

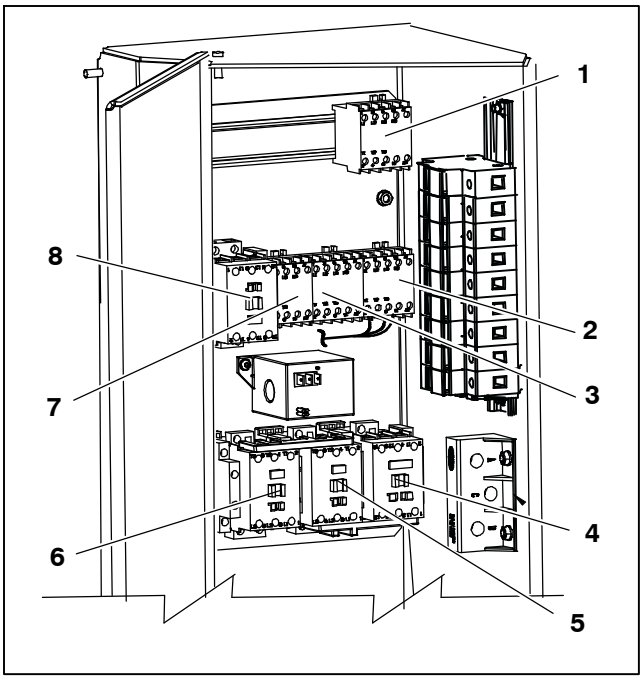
f. If the reading is less than 200 MΩ, run the unit for 15 minutes to dry out the windings and test again. If the reading does not improve to above 200 MΩ after running 15 minutes, check for a short to ground by:

- Visually inspecting the tested component for any poor connections or chafed wires
- Isolating the component and wire harness.
- Retesting the harness and component (i.e. the motor windings) with the megohmmeter to determine where the short to ground is located

g. Continue testing each of the red wires on PSCON T2 and T3 terminals. Each should measure greater than 200 MΩ. If not, follow the procedure outlined in Step f. above.

h. To complete the test, all high voltage contactor connections must be tested on their T1, T2 and T3 terminals. See Figure 8–33 The fuses and the Overload Ground Fault Module (OGF) do not need to be tested.

i. Following the completion of all testing, reconnect the generator ground wire at the unit ground plate.



1. Heater contactor 1 (1HTCON1)
2. Condenser motor contactor (CDCON)
3. Evaporator motor contactor (1EVCON)
4. Power supply contactor (PSCON)
5. Power supply contactor 2 (PSCON2)
6. Generator contactor (GENCON)
7. Heater contactor 2 (1HTCON2)
8. Compressor contactor (CCON)

Figure 8–33 High Voltage Contactors

8.9.2 Phase Reversal Module (PRM)

One principle of three phase motors is that the direction of rotation will be reversed if any two wires going to the motor are reversed. When operating on the generator, the wiring is not changed and therefore the PRM is not active. However, when operating on standby power, the incoming power may be reversed. The function of the phase reversal module is to monitor the incoming standby power and reverse the power to the motors if that incoming power will result in incorrect rotation.

When the unit is started in standby, power is supplied to the PRM +12V terminal to activate the PRM. Refer to wiring schematic, Section 10. Once the PRM is activated, it will provide a 12VDC power signal to the microprocessor at terminal 5MP04 to signal the microprocessor that Standby Operation has been selected and high voltage has been detected at the power plug. The PRM has two output contacts PRM IN S1 and PRM IN S2. If incoming power is correct, the PRM IN S1 contact is closed, energizing PSCON to supply power to the motors. If any two incoming power wires are reversed, the PRM IN S2 contact are closed, energizing PSCON2 to supply power to the motors. Both PSCON and PSCON2 have a set of normally closed auxiliary contacts wired in series with the “other” contactor to prevent energizing of both contactors at the same time.

To test the PRM:

a. Check for 460 VAC power from the power plug to the PRM. If required, correct wiring or power source.

b. Check for 12 VDC to the +12V from the switch. If required, correct wiring.

c. Check for ground at the PRM OV terminal. If required, correct wiring.

d. Check for a 12 VDC signal from the PRM to microprocessor terminal 5MP04. If required, correct wiring from PRM to the microprocessor.

e. If all wiring and voltage readings are correct, replace PRM.

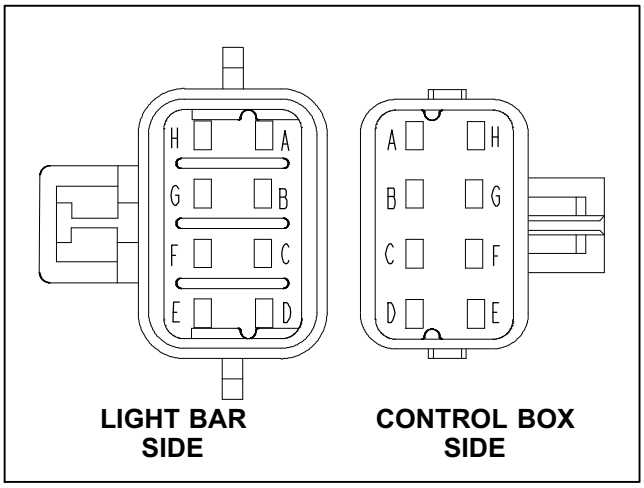


Figure 8–34 Light Bar Connections

8.9.3 Light Bar

The light bar may be tested using a 12 VDC source. To test the light bar:

a. Connect the ground (-) from the power source to pin B on the light bar side of the connector.

b. The green LEDs will illuminate when the 12 VDC side (+) of the power source is connected to pin G.

c. With the connection as in the preceding steps (+ on pin G, and - on pin B), the amber LEDs will illuminate when the ground (-) from the power source is also connected to pin G.

8.9.4 Overload Ground Fault (OGF)

a. Operation

The OGF is designed to detect current overload and fault to ground in the AC voltage circuits. The function of the OGF is to shut down the power supply (generator or standby) when current is over 40 amp for 2 seconds, or leakage to ground is more than 150mA.

Power, from SP52, energizes the OGF at terminal +12 V. The module is grounded by the microprocessor at the OV terminal through microprocessor terminal 1MP15.

This power also flows through the OGF normally closed contacts and the S+ terminal to the GENCONR relay, PSCONR relay and microprocessor terminal 2MP26. If an overload or excessive leakage to ground condition exists, the OGF contacts open to de-energize the relays and stop the flow of power to microprocessor terminal 2MP26. Loss of power at 2MP26 activates the A100 - "OVERLOAD/GROUND FAULT" alarm and illuminates the OGF mounted fault LED.

b. OGF Checkout Procedure

1. Check the FAULT LED on the module. If the LED is illuminated the module has activated and 12 VDC power supply is correct. Perform a megohm test (refer to Section 8.9.1) to determine if a fault to ground exists. This test will also help determine if an excessive current condition exists due to leakage to ground. Repair wiring or components as required.
2. If a problem with the module is suspected, check for 12VDC power to the module at the +12V terminal and ground at the OV terminal. Correct wiring as required. Reset module by placing the Main Power switch in the OFF position and then back in the desired position. Check for 12 VDC at the S+ terminal. If LED is off and the module normally closed connection is open, replace module.
3. If module is OK, check for 12 VDC at SP61 and wiring through to microprocessor terminals 2MP26, 4MP7 & 5MP7 as required.
4. If a problem with the current sensors is suspected, check sensor output. Current sensor inputs to the module are rated at 16.7mV per Amp. For every Amp that is read at the wires coming from the GENCON T1, T2 and T3 terminals with an amp meter, there should be a corresponding voltage reading on the blue, brown & orange wires to the black wire. For example: 20Amps = 0.33VAC.

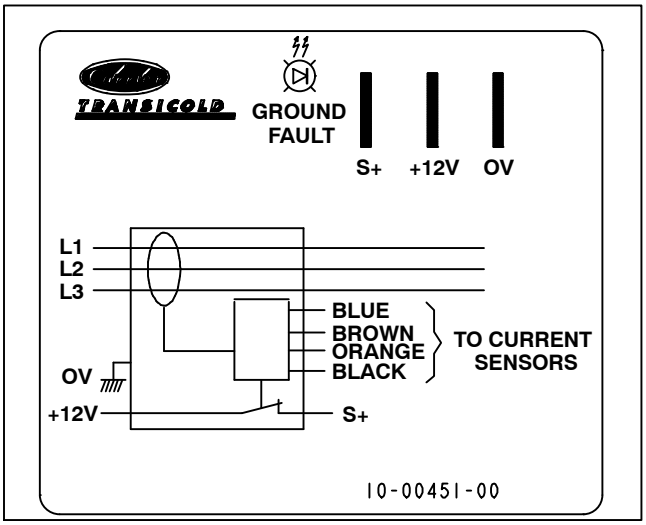


Figure 8–35 Overload Ground Fault Connections

8.9.5 Evaporator Heaters

NOTE

A good preliminary test of the heaters is to run a Pretrip and check for heater alarms

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

b. Remove the lower back panel or coil cover as applicable.

c. To determine which heater assembly needs to be replaced , disconnect the suspect heater assembly and check pin to pin resistance. For heater resistance refer to Section 2.11.

d. Remove the heater mounting brackets.

e. Remove and replace faulty heater. If removing a drain pan heater, carefully remove heater from the clips on the drain pan.

f. When reinstalling brackets torque to 6 to 7 ft/lbs (8.1 to 9.5 Nm). Rods should move freely from side to side when installed.

g. Route and secure electrical cables. Route along the lower side of the heat exchanger at the 5 o'clock position (on the side closest to the evaporator coil). Ensure that all wires are clear of heaters.

8.9.6 Evaporator Blower & Motor

NOTE:

The blower motor bearings are factory sealed and do not require additional grease.

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

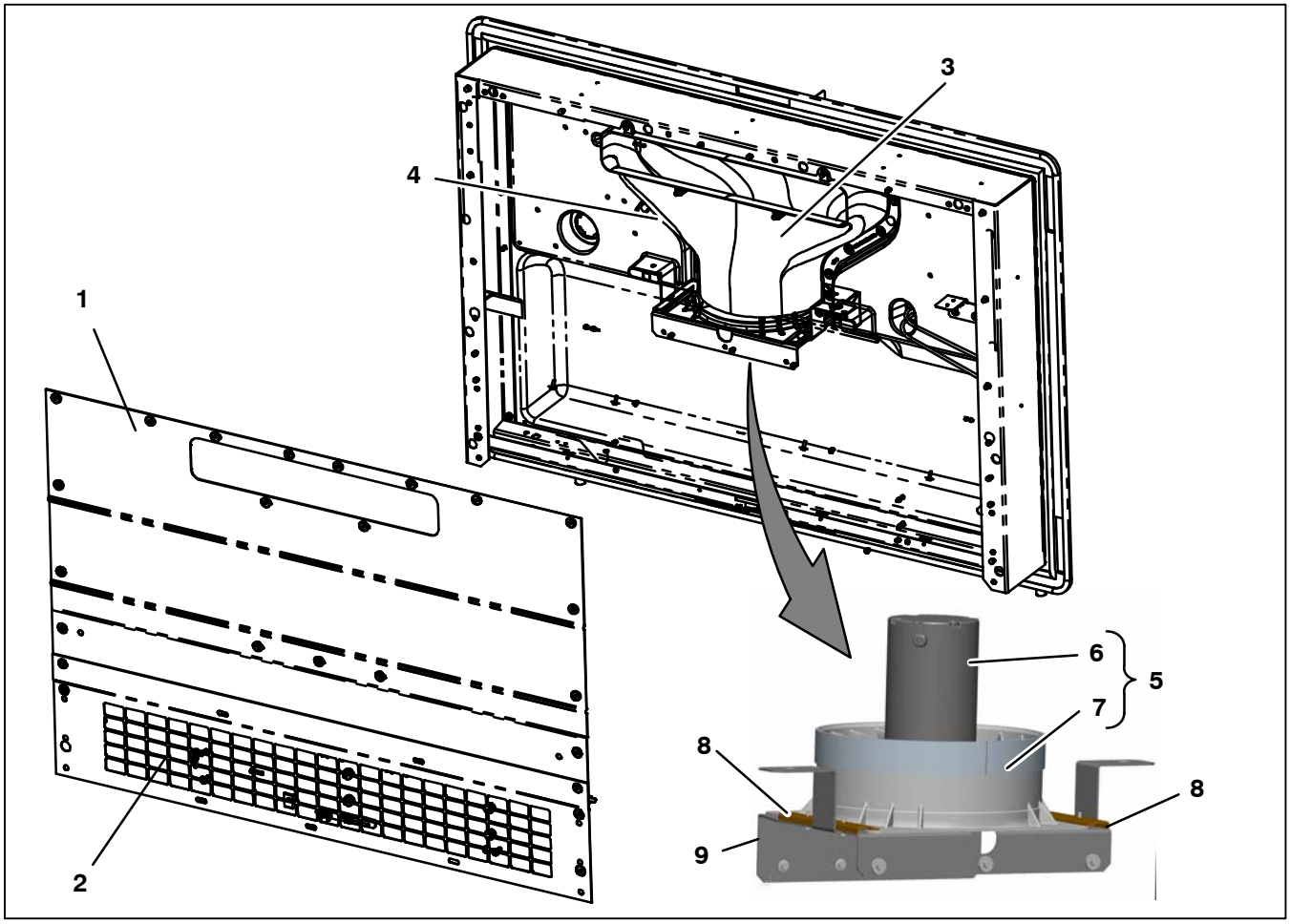
b. From inside of trailer, remove back panel and grille (see Figure 8–36).

c. Disconnect the motor electrical connector.

d. Remove the supply air sensor and then remove the nozzle.

e. Loosen the four bolts on the underside of the support bracket that fasten the two mounting brackets.

f. Slide the blower assembly off the support bracket and out of the unit.



1. Access panel
2. grille
3. Nozzle
4. Supply Air Sensor
5. Blower Assembly
6. Motor
7. Stator
8. Mounting Brackets
9. Support Bracket

Figure 8–36 Evaporator Blower Assembly

g. To remove the fan, loosen the nut holding the blade to the motor shaft using impact gun.

h. To remove motor remove four bolts that hold motor to the stator.

i. Complete the assembly in reverse order of removal. Coat motor shaft with never-seize before assembly. Torque:

Fan Nut	37 to 43 ft/lbs (50 to 58 Nm)
Motor Mounting Bolts	5.5 to 7.5 ft/lbs (7.5 to 10 Nm)
Mounting Bracket Bolts	5 to 7 ft/lbs (6.8 to 9.5 Nm)

8.9.7 Condenser Fan Assemblies

a. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

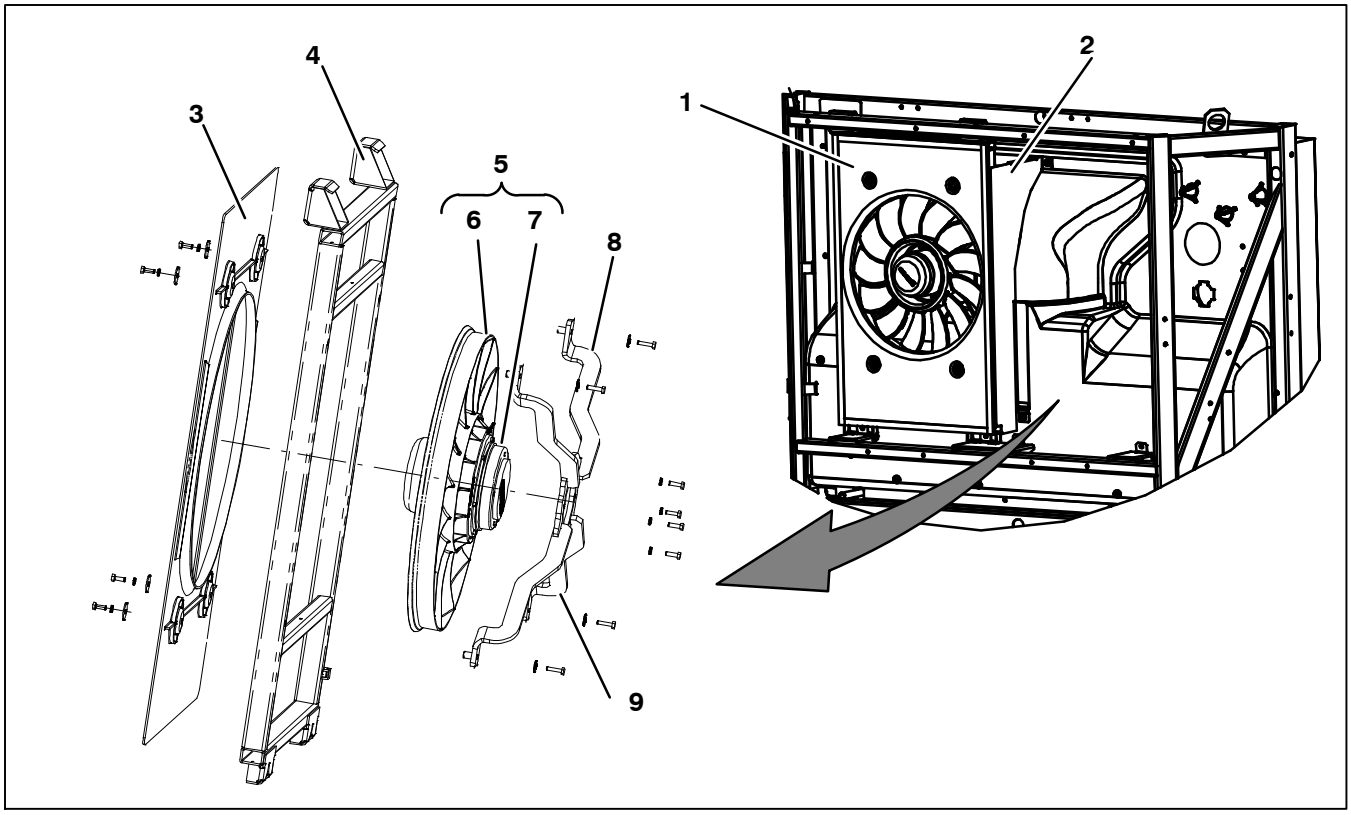
b. Disconnect the motor electrical connector. Note motor is assembled to allow routing of the wiring down the lower right hand leg of the welded support. See Figure 8–37

c. Remove the condenser fan assembly mounting bolts and slide the assembly out of unit. If required, the divider may be removed by removing the upper and lower mounting bolts.

d. Disassemble the fan and motor assembly from the mounting and then disassemble the fan from the motor as required.

e. Complete the assembly in reverse order of removal. When mounting fan & motor assembly, assemble so wire connector is in line with lower right welded support leg, see in Figure 8–37. Torque:

Fan to motor bolts	4 to 6 ft/lbs (5.5 to 6.8 Nm)
Fan & motor assembly to welded support bolts	5 to 6 ft/lbs (6.8 to 8.1 Nm)
Welded support to frame bolts	7 to 8 ft/lbs (9.5 to 10.8 Nm)
Shroud to frame and frame to unit bolts	6 to 7 ft/lbs (8.1 to 9.5 Nm)



1. Condenser Fan Assembly
2. Divider
3. Shroud
4. Frame
5. Fan & Motor Assembly
6. Fan
7. Motor
8. Welded Support
9. Wire Routing

Figure 8–37 Condenser Fan Assembly

8.9.8 Battery Charger (BTYC)

NOTE

A battery of known good condition must be connected to the charger before doing the following test.

a. Run the unit with the battery charger connected to the battery as usual.

b. Using a clamp-on ammeter, take a reading of the amperage on both output wires of the battery charger. If charging current is between 3 and 20 Amps, for 20 amp (single phase) chargers, or 3 and 40 amps, for 40 amp (three phase) chargers, the battery charger is functioning correctly.

c. If charging Amps = 0 check the AC input voltage to the charger. The AC input voltage range should be between 350 and 600 VAC.

d. If there is no AC voltage, ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.

e. Check battery charger fuses and inspect fuse holder wire connections. Inspect plugs, pins and wires at charger connections.

f. If input voltage, wiring connections and the fuses are good, replace the battery charger.

8.9.9 Generator (GEN)

a. Preventive Maintenance and Operating Precautions

⚠ WARNING

Be aware of HIGH VOLTAGE supplied at the power plug or from the generator. When performing service or maintenance procedures: ensure any two way communication is disabled in accordance with the manufacturer's instruction, ensure the Main Power Switch is in the OFF position and, whenever practical, disconnect the high voltage source, lockout/tagout the receptacle and disconnect the negative battery connection. NEVER dis-assemble the generator: HIGH MAGNETIC FIELD INSIDE! This field can interfere with cardiac implants such as pacemakers and defibrillators.

⚠ WARNING

Do not direct water or steam into the generator openings. Do not allow any soap and water solutions to enter the generator.

NOTE

Always test suspect generators with a megohmmeter. (Refer to Section 8.9.1.)

⚠ WARNING

Generators of this type should not be "flashed." Operation with external voltage source or momentary shorting of leads will damage the generator and may cause injury.

Costly repairs and down time can usually be prevented by operating electrical equipment under conditions which are compatible with those at which the equipment was designed. Follow the instructions outlined below to ensure maximum efficiency of the electrical equipment.

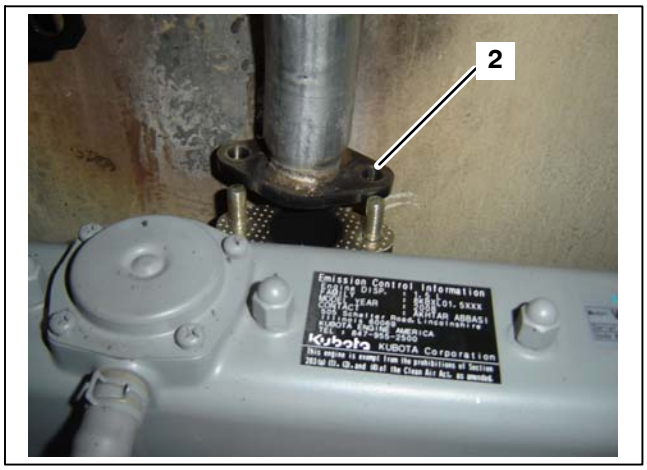
- **Drying the Generator Windings**

Generators that have been in transit, recently steam cleaned, or in storage for long periods may be subjected to extreme temperature and moisture changes. This can cause excessive condensation, and the generator windings should be thoroughly dried out before bringing the generator up to full nameplate voltage. If this precaution is not taken, serious damage to the generator can result.

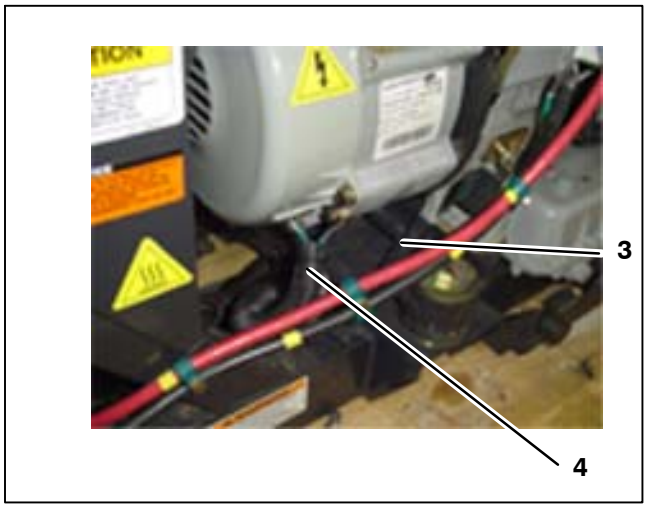
Always test suspect motors, or generators described above, with a megohmmeter (Refer to Section 8.9.1). Do not set voltage higher than rating on wiring insulation in order not to prevent insulation breakdown during testing. Test each winding to ground, looking for very high megohmmeter readings. Also test each phase to phase winding looking for a low ohm reading but with equal reading across all phases.

b. Generator Removal

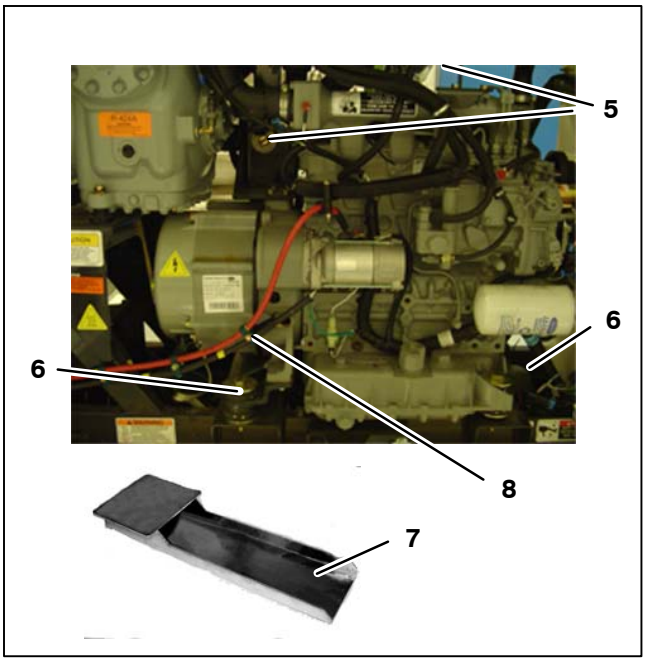
1. Ensure the unit will not start automatically by disabling any two way communication and placing the Main Power switch in the OFF position. Disconnect the high voltage source and lockout/tagout the receptacle.



2. Remove the nuts (2) from the exhaust connection.



3. Disconnect ground wire.
4. Cut the generator cables. (Leave the same length as new generator wires.)



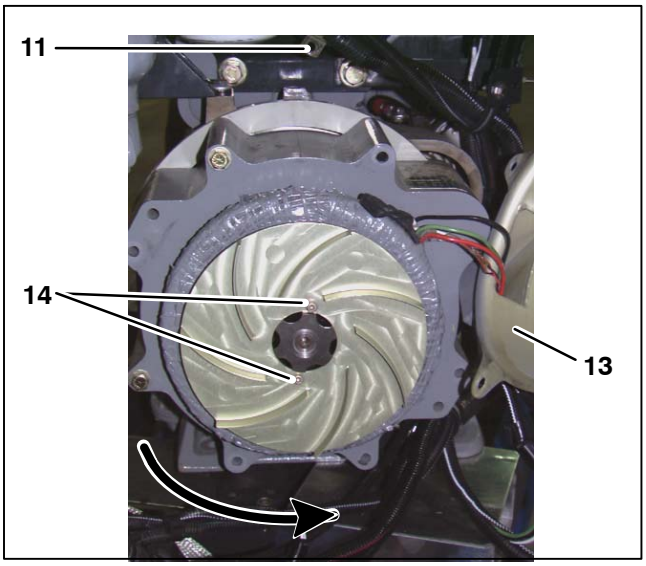
5. Unbolt snubber. Unplug the ENSCU.
6. Remove the locking plates from the rear engine mounting bolts and then remove the engine frame bolts (Leave front bolt on pump side loose.)
7. Place the engine support tool (P/N 86-04751-00.)
8. Unbolt battery cable clamps.



9. Remove fuel filter assembly. Unclamp hoses.



10. Use tool (Carrier Transicold part number 07-60083-00) to lock the engine flywheel



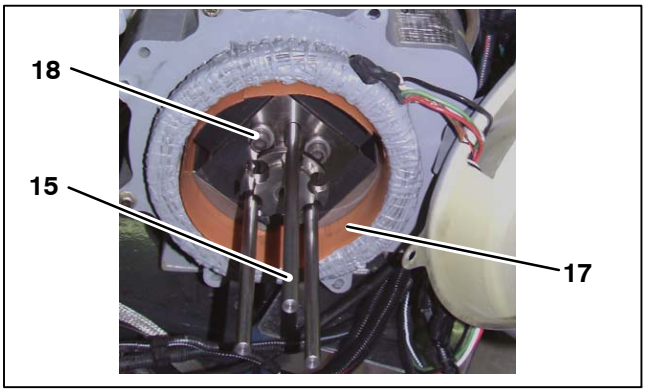
11. Pull the harness on the top of generator out of the way.
12. Swing out the engine.
13. Remove the fan cover (4 bolts)
14. Remove the fan blade center screw. Using two 6mm bolts and a puller, remove the blade. NOTE: DO NOT use 6mm bolts to drive the fan off.

⚠ CAUTION

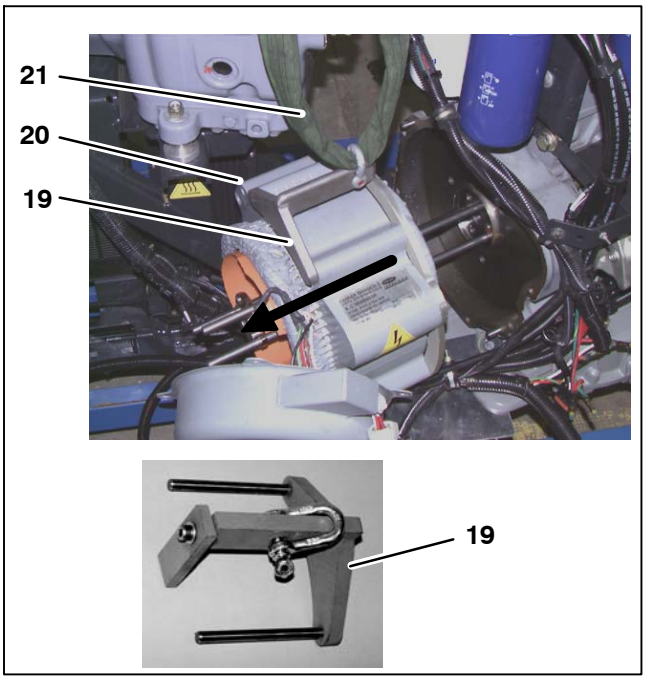
A mica shim (Carrier Transicold part number 54-00630-25) must be installed before removal of the generator. The generator is to be removed as one piece, with the shim in place. DO NOT attempt to remove the rotor from the stator.

NOTE

Do not remove and use the shim from a replacement generator, the replacement generator shim must remain in place until the generator is installed.

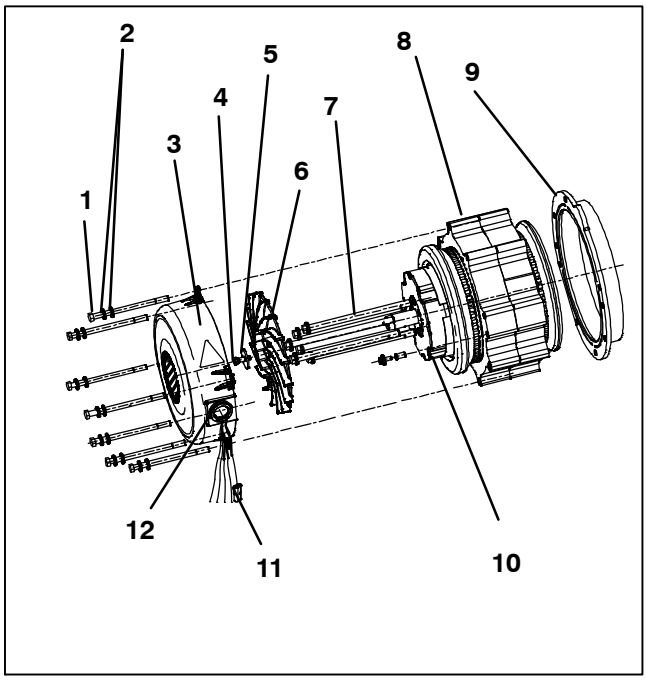


15. Remove 3 of the 6 flywheel bolts on the generator.
16. Insert 3 guiding rods (P/N : SKM 5671.)
17. Place the mica shim (P/N 54-00630-25) between the rotor and the stator prior to loosening any other bolts.
18. Remove the last 3 flywheel bolts.



19. Install the lifting tool (Carrier Transicold part number 07-60085-01).
20. Remove the remaining stator bolts.
21. Remove the generator with a sling. DO NOT pry against the spacer between engine and generator.

c. Generator Assembly Procedure



1. Bolt, Stator
2. Washer, Stator
3. Fan Cover
4. Fan Mount Bolt
5. Fan Mount Washer
6. Fan
7. Bolt, Rotor
8. Stator
9. Spacer
10. Rotor
11. Generator Leads
12. Grommet

Figure 8–38 Generator Assembly

1. Verify the existence and condition of the two original dowel pins in the bell housing. (See Figure 8–39, CTD P/N 34-06210-00 - not included in the kit). The pins are to be installed with the chamfer facing out.

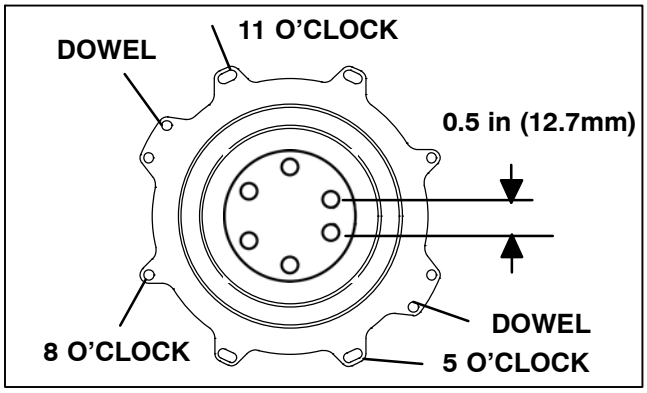


Figure 8–39 Bolt Hole Pattern For Bell Housing and Crankshaft

2. Remove the flywheel and inspect it for any debris or damage.
3. Install spacer (Item 9, Figure 8–38) onto the bell housing using the dowel pins.

NOTE

Install the spacer so the irregularly shaped piece covers the starter opening.

4. Locate two screw holes on the face of the crankshaft which are approximately 0.5 in (12.7mm) apart. See Figure 8–39, all other screw holes are approximately 0.75 in (19mm) apart.
5. Assemble two guide rods (CTD P/N SKM-5671) into the two holes on the crankshaft located in the previous step. Assemble the third rod across from the first two rods.
6. Install the flywheel on the crankshaft using the guide rods to align properly. Make sure the flywheel mates with the crankshaft with no rocking or side to side movement.
7. Lift the generator using the lifting tool and hang it in front of the engine. Make sure the generator leads (Item 11, Figure 8–38) exit the stator winding on the side away from the engine.
8. The mounting holes on the generator rotor (Item 10) have two holes offset to match the ones in the crankshaft and flywheel. Locate them and turn the engine to line up the guide rods in the crankshaft with the offset holes in the generator rotor.

NOTE

The generator rotor does not turn in the stator.

9. Slide the generator rotor over the guide rods and mate the stator with the spacer installed in step 3. Ensure the dowel pins in the bell housing are fully engaged in the stator.

NOTE

The generator should slide freely on the guide rods if the holes in the generator rotor are matched correctly with the crank shaft holes. Otherwise it will bind up and the stator will not mate properly with the spacer.

10. Using new screws (DO NOT reuse old screws), install three screws and three washers to the rotor and tighten.

NOTE

The screws will be torqued later.

11. Remove the guide rods and assemble and tighten the remaining three rotor screws and washers.

NOTE

The screws will be torqued later.

12. Install and tighten three stator screws and two washers with each screw in the following locations:

    One in five o'clock location (See Figure 8–39)

    One in eight o'clock location

    One in eleven o'clock location

NOTE

The remaining four stator mounting bolts will be installed and will all be torqued after the fan cover is installed.

13. Torque the rotor bolts to 90-110 foot-pounds (122 to 149 Nm) using an alternating sequence.

NOTE

Mark each rotor screw after it is torqued to ensure that all the screws are torqued.

14. Remove the mica shim that is between the stator and the rotor.

15. Install the fan onto the rotor.

NOTE

The fan must be installed with blades away from the engine.

16. Torque the fan screw to 10-12 foot-pounds (14 to 16 Nm.

17. Feed all the wires through the inside of the fan cover side opening. Ensure there are no loops or wires laying on the stator end.

18. Install the fan cover (Item 3) onto the generator stator and install the remaining mounting screws and washers.

NOTE

Make sure the insulation on lead wires is not damaged during assembling of the fan cover.

Each mounting screw must be assembled with two washers.

19. Torque the stator mounting screws to 33-37 foot pounds (44.8Nm to 50.1 Nm).

NOTE

Mark each stator screw after it is torqued to ensure that all the screws are torqued.

20. Assemble the strain grommet (Item 12).

21. Reconnect wires.

22. Reassemble engine into unit.

8.9.10 Sensor Checkout

An accurate ohmmeter must be used to check resistance values shown in Table 8–5 or Table 8–6.

Due to variations and inaccuracies in ohmmeters, thermometers or other test equipment, a reading within 2% of the chart value would indicate a good sensor. If a sensor is bad, the resistance reading will usually be much higher or lower than the resistance values given in the tables.

Two preferred methods of determining the actual test temperature at the sensor, is an ice bath at 32°F (0°C) or a calibrated temperature tester.

Table 8–5 Sensor Resistance

Sensors AAT, 1RAT, 1SAT, ENCT, EVOT, CST, 1DTT, REMSN 1 & 2												
°F	°C	Ohms	°F	°C	Ohms	°F	°C	Ohms	°F	°C	Ohms
-40	-40	336,500	18	-7.8	49,060	76	24.4	10,250	134	56.7	2,809
-38	-38.9	312,600	20	-6.7	46,230	78	25.6	9,760	136	57.8	2,697
-36	-37.8	290,600	22	-5.6	43,580	80	26.7	9,299	138	58.9	2,590
-34	-36.7	270,300	24	-4.4	41,100	82	27.8	8,862	140	60.0	2,488
-32	-35.6	251,500	26	-3.3	38,780	84	28.9	8,449	142	61.1	2,390
-30	-34.4	234,200	28	-2.2	36,600	86	30.0	8,057	144	62.2	2,297
-28	-33.3	218,200	30	-1.1	34,560	88	31.1	7,686	146	63.3	2,208
-26	-32.2	203,400	32	0	32,650	90	32.2	7,334	148	64.4	2,124
-24	-31.1	189,700	34	1.1	30,850	92	33.3	7,000	150	65.6	2,042
-22	-30	177,000	36	2.2	29,170	94	34.4	6,684	155	68.3	1,855
-20	-28.9	165,200	38	3.3	27,590	96	35.6	6,384	160	71.1	1,687
-18	-27.8	154,300	40	4.4	26,100	98	36.7	6,099	165	73.9	1,537
-16	-26.7	144,200	42	5.5	24,700	100	37.8	5,828	170	76.7	1,402
-14	-25.6	134,800	44	6.6	23,390	102	38.9	5,571	175	79.4	1,281
-12	-24.4	126,100	46	7.7	22,160	104	40.0	5,327	180	82.2	1,171
-10	-23.3	118,100	48	8.9	20,990	106	41.1	5,095	185	85.0	1,072
-8	-22.2	110,500	50	10	19,900	108	42.2	4,874	190	87.8	983
-6	-21.1	103,600	52	11.1	18,870	110	43.3	4,665	195	90.6	902
-4	-20	97,070	54	12.2	17,900	112	44.4	4,465	200	93.3	829
-2	-18.9	91,030	56	13.3	16,980	114	45.5	4,275	205	96.1	762
0	-17.8	85,400	58	14.4	16,120	116	46.7	4,095	210	98.9	702
2	-16.7	80,160	60	15.5	15,310	118	47.8	3,923	215	101.7	647
4	-15.6	75,270	62	16.6	14,540	120	48.9	3,759	220	104.4	598
6	-14.4	70,720	64	17.7	13,820	122	50.0	3,603	225	107.2	553
8	-13.3	66,460	66	18.9	13,130	124	51.1	3,454	230	110.0	511
10	-12.2	62,500	68	20.0	12,490	126	52.2	3,313	235	112.8	473
12	-11.1	58,790	70	21.1	11,880	128	53.3	3,177	240	115.6	438
14	-10.0	55,330	72	22.2	11,310	130	54.4	3,049	245	118.3	406
16	-8.9	52,090	74	23.3	10,760	132	55.6	2,926	250	121.1	378

Table 8–6 Sensor Resistance (CDT)

°C	°F	Ohms	°C	°F	Ohms	°C	°F	Ohms	°C	°F	Ohms
-40	-40	3,360,000	0	32	325,860	40.0	104	53,330	101.7	215	6,510
-38.9	-38	3,121,020	1.1	34	307,970	41.1	106	51,010	104.4	220	6,000
-37.8	-36	2,900,710	2.2	36	291,180	42.2	108	48,800	107.2	225	5,540
-36.7	-34	2,697,500	3.3	38	275,410	43.3	110	46,710	110.0	230	5,130
-35.6	-32	2,509,940	4.4	40	260,590	44.4	112	44,710	112.8	235	4,760
-34.4	-30	2,336,720	5.5	42	246,670	45.5	114	42,820	115.6	240	4,410
-33.3	-28	2,186,670	6.6	44	233,570	46.7	116	41,010	118.3	245	4,090
-32.2	-26	2,028,680	7.7	46	221,260	47.8	118	39,290	121.1	250	3,800
-31.1	-24	1,891,780	8.9	48	209,670	48.9	120	37,660	126.7	260	3,290
-30	-22	1,765,060	10	50	198,760	50.0	122	36,100	132.2	270	2,850
-28.9	-20	1,647,700	11.1	52	188,490	51.1	124	34,610	137.8	280	2,490
-27.8	-18	1,538,950	12.2	54	178,820	52.2	126	33,200	143.3	290	2,170
-26.7	-16	1,438,120	13.3	56	169,700	53.3	128	31,850	148.9	300	1,910
-25.6	-14	1,344,580	14.4	58	161,100	54.4	130	30,560	154.4	310	1,680
-24.4	-12	1,257,770	15.5	60	152,990	55.6	132	29,330	160.0	320	1,480
-23.3	-10	1,177,150	16.6	62	145,340	56.7	134	28,160	165.5	330	1,310
-22.2	-8	1,102,240	17.7	64	138,120	57.8	136	27,040	171.1	340	1,160
-21.1	-6	1,032,600	18.9	66	131,310	58.9	138	25,970	176.7	350	1,040
-20	-4	967,830	20.0	68	124,870	60.0	140	24,960	182.2	360	920
-18.9	-2	907,560	21.1	70	118,790	61.1	142	23,980	187.8	370	830
-17.8	0	851,450	22.2	72	113,040	62.2	144	23,050	193.3	380	740
-16.7	2	799,180	23.3	74	107,600	63.3	146	22,160	198.9	390	670
-15.6	4	750,470	24.4	76	102,460	64.4	148	21,310	204.4	400	600
-14.4	6	705,060	25.6	78	97,600	65.6	150	20,500	210.0	410	540
-13.3	8	662,690	26.7	80	92,990	68.3	155	18,980	215.6	420	490
-12.2	10	623,150	27.8	82	88,630	71.1	160	16,940	221.1	430	450
-11.1	12	586,230	28.9	84	84,510	73.9	165	15,450	226.7	440	410
-10.0	14	551,740	30.0	86	80,600	76.7	170	14,070	232.2	450	370
-8.9	16	519,500	31.1	88	76,890	79.4	175	12,870	237.8	460	340
-7.8	18	189,690	32.2	90	73,380	82.2	180	11,750	243.3	470	310
-6.7	20	461,170	33.3	92	70,040	85.0	185	10,750	248.9	480	280
-5.6	22	434,790	34.4	94	66,880	87.8	190	9,870	254.4	490	260
-4.4	24	410,080	35.6	96	63,880	90.6	195	9,050	260.0	500	240
-3.3	26	386,940	36.7	98	61,040	93.3	200	8,320			
-2.2	28	365,260	37.8	100	58,330	96.1	205	7,650			
-1.1	30	344,930	38.9	102	55,770	98.9	210	7,050			

Table 8–7 Temperature Pressure Chart

Temperature		Pressure			Temperature		Pressure	
°C	°F	BAR	PSIG		°C	°F	BAR	PSIG
-40	-40	0.3	4.5		0	32	5.0	72.5
-37	-35	0.5	7.1		1	34	5.2	75.6
-34	-30	0.7	9.9		2	36	5.4	78.8
-32	-25	0.9	12.9		3	38	5.7	82.1
-29	-20	1.1	16.3		4	40	5.9	85.5
-28	-18	1.2	17.7		6	42	6.1	89.0
-27	-16	1.3	19.2		7	44	6.4	92.5
-26	-14	1.4	20.7		8	46	6.6	96.2
-24	-12	1.5	22.3		9	48	6.9	99.9
-23	-10	1.7	23.9		10	50	7.2	103.7
-22	-8	1.8	25.6		13	55	8.0	115.4
-21	-6	1.88	27.3		16	60	8.7	126.1
-20	-4	2.0	29.1		18	65	9.5	137.4
-19	-2	2.1	30.9		21	70	10.3	149.4
-18	0	2.3	32.8		24	75	11.2	162.1
-17	2	2.4	34.8		27	80	12.1	175.5
-16	4	2.5	36.8		29	85	13.1	189.6
-14	6	2.7	38.9		32	90	14.1	204.5
-13	8	2.8	41.1		35	95	15.2	220.2
-12	10	3.0	43.3		38	100	16.3	236.8
-11	12	3.1	45.6		41	105	17.5	254.2
-10	14	3.3	48.0		43	110	18.8	272.4
-9	16	3.5	50.4		46	115	20.1	291.6
-8	18	3.7	52.9		49	120	21.5	311.8
-7	20	3.8	55.5		52	125	23.0	332.9
-6	22	4.0	58.1		54	130	24.5	355.0
-4	24	4.2	60.9		57	135	26.1	378.1
-3	26	4.4	63.7		60	140	27.7	402.3
-2	28	4.6	66.5		63	145	29.5	427.6
-1	30	4.8	69.5		66	150	31.3	454.0

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SECTION 9

UNIT TROUBLESHOOTING

⚠ CAUTION

Under no circumstances should anyone attempt to repair the keypad, display or internal control module components. Should a problem develop with these components, contact your nearest Carrier Transicold dealer for replacement.

NOTE

Run a Pretrip and check all active alarms before continuing with troubleshooting.

9.1 ENGINE

Indication/Trouble	Possible Causes	Action/Reference Section
NOTE: Refer to section 9.5 for electronic speed control system diagnoses		
9.1.1 Engine Will Not Start		
Starter motor will not crank or low cranking speed	Battery insufficiently charged	9.2
	Battery terminal post dirty or defective	Check
	Bad electrical connections at starter	Check
	Starter motor malfunctions	9.1.4
	Starter motor solenoid defective	Engine Manual
	Open starting circuit	9.1.5
	Incorrect grade of lubricating oil	2.8
	Internal generator damage	8.9.9
Starter motor cranks but engine fails to start	No fuel in tank	Check
	Air in fuel system	8.5.2
	Water in fuel system	Drain Sump & 8.5.5
	Plugged fuel filter	8.5.5
	Plugged inlet screen to mechanical pump.	8.5.3
	Plugged inlet screen to electric pump.	8.5.4
	Plugged fuel lines to injector(s)	Check
	ESC defective	9.5
	Intake air heater defective	8.5.10
Starter cranks, engages, but dies after a few seconds	Incorrect grade of lubricating oil	2.8
	Voltage drop in battery cable(s)	Check
	ESC defective	9.5

Indication/Trouble	Possible Causes	Action/Reference Section
9.1.2 Engine Starts Then Stops		
Engine stops after several rotations	Fuel supply restricted	Check
	No fuel in tank	Check
	Leak in fuel system	Check
	Faulty fuel control operation	Engine Manual
	Plugged fuel filter	8.5.5
	Plugged inlet screen to mechanical pump.	8.5.3
	Plugged inlet screen to electric pump.	8.5.4
	Injector nozzle(s) defective	Engine Manual
	Injection pump defective	Engine Manual
	Air cleaner or hose restricted	8.5.9
	Safety device open	2.13
	ESC defective	9.5
	Electric fuel pump malfunction	8.5.4
	Mechanical fuel pump malfunction	Engine Manual
	Oil pressure switch defective	Replace
9.1.3 Engine Will Not Shut Off		
Engine will not shut off	ESC operation defective	9.5
9.1.4 Starter Motor Malfunction		
Starter motor will not crank or turns slowly	Battery insufficiently charged	9.2
	Battery cable connections loose or oxidized	Check
	Battery cables defective	Replace
	Starter brushes shorted out	Engine Manual
	Starter brushes hang up or have no contact	Engine Manual
	Starter solenoid damaged	Engine Manual
	Incorrect grade of lubricating oil	2.8
Starter motor turns but pinion does not engage	Pinion or ring gear obstructed or worn	Clean both, remove burrs, or replace
Starter motor does not disengage after engine starts	Starter motor solenoid defective	Engine Manual
	Defective starter	Engine Manual
9.1.5 Malfunction In The Engine Starting Circuit		
No power to starter solenoid (SS)	Battery defective	Check
	Loose electrical connections	Tighten
	ESC defective	9.5
	No power to Starter Solenoid connector	9.5

Indication/Trouble	Possible Causes	Action/Reference Section
9.1.6 Miscellaneous Engine Troubleshooting		
Loss of power	Air cleaner or hose restricted	8.5.9
	Air in fuel system	8.5.2
	Air vent restricted in fuel tank cap	Clean
	Restricted fuel lines	Engine Manual
	Defective fuel injection pump	Engine Manuall
	Defective injector(s) or incorrect type	Engine Manual
	Incorrect fuel injection pump timing	Engine Manuall
	Incorrect valve timing	Engine Manual
	Poor compression	Engine Manual
Vibration	Engine shockmounts defective	Replace
	Poor compression	Engine Manual
Overheating	Air cleaner or hose restricted	8.5.9
	Exhaust pipe restriction	Remove
	Restriction in water jacket	Engine Manual
	Restriction in radiator	8.5.12
	Coolant level too low	8.5.12
	Loose water pump	Engine Manual
	Defective thermostat	Engine Manual
	Defective water pump / belt	Engine Manual
Excessive crankcase pressure	Plugged crankcase breather	8.5.14

9.2 BATTERY CHARGER

Indication/Trouble	Possible Causes	Action/Reference Section
F7 or F8 or F29 (if applicable) fuse blows	Short in 12 volt wiring causing overload of charger	8.9.8
	Internal short	8.9.8
Charging rate does not taper back after charging for a few minutes of engine crank	Bad cell in battery	Test battery for defect according to battery manufacturer's instructions
	Defective charger	Replace
Charger does not charge	Open F7 or F8or F29 (if applicable)	Replace.
	Charger is not receiving AC input	8.9.8
	Charger output is not connected to 12 volt battery	Check output wiring connections to battery.
	Defective charger	Replace
Low output voltage measured across charger output	Battery not connected to charger. It is normal to measure 12 volts or less across charger output with no battery connected	Check charging leads from charger to battery

9.3 GENERATOR

Indication/Trouble	Possible Causes	Action/Reference Section
No voltage with engine running	Damaged harness	Check
	GENCON damaged	Check
	Open or short in stator windings	Check
Low voltage	Low engine speed	Correct
	Excessive load	Check
	High resistance connections - connections warm or hot	Clean and Tighten
Fluctuating voltage	Fluctuating speed	9.5
	Irregular speed of engine	9.5
	Loose terminal or load connections	Tighten
High voltage	Excessive engine speed	9.5
Overheating	Generator overloaded	Check
	Clogged ventilation openings	Clean
	Insufficient circulation	Check Fan
	Unbalanced load	Balance
Mechanical Noise	Loose laminations	8.9.9

9.4 REFRIGERATION / TEMPERATURE CONTROL

Indication/Trouble	Possible Causes	Action/Reference Section
9.4.1 Unit Will Not Cool		
Compressor malfunction	Compressor contactor or relay defective	Check
	Compressor defective	8.7.1
Refrigeration system	A defrost cycle did not terminate. Check DTT	8.9.10
	Abnormal pressure	9.4.8
	Check system for noncondensibles	8.6.2
9.4.2 Unit Runs But Has Insufficient Cooling		
Compressor	Compressor internal damage	8.7.1
	Unloader malfunction	8.7.6
Refrigeration system	Abnormal pressure	9.4.8
	Unloader malfunction	8.7.6
	Expansion valve malfunction	9.4.11
	No or restricted evaporator airflow	9.4.10
	Suction Modulation Valve malfunction	8.8.5
	Check system for noncondensibles	8.6.2
9.4.3 Unit Operates Long Or Continuously In Cooling		
Refrigerated Compartment	Hot Load	Allow time to pull down
	Defective or insufficient refrigerated compartment insulation or air leak	Correct
Refrigeration system	Abnormal pressure	9.4.8
	Temperature sensor malfunction	8.9.10
	Check system for noncondensibles	8.6.2
Compressor	Defective	8.7.1

Indication/Trouble	Possible Causes	Action/Reference Section
9.4.4 Unit Will Not Terminate Cooling		
Unit fails to stop cooling	Temperature sensor malfunction	8.9.10
	Contactor (CCON) stuck closed	Check
	Microprocessor improperly set	Check set point Check whether microprocessor is set at °C or °F
9.4.5 Unit Will Not Heat Or Has Insufficient Heating		
Unit will not heat or has insufficient heat	Heater(s) defective	8.9.5
	Heater contactors or coil defective	Replace
	Defective wiring / connectors	Replace
	Loose terminal connections	Tighten
	Low voltage	9.3
	No or restricted air flow	9.4.10
	Temperature sensor malfunction	8.9.10
	Compressor contactor stuck closed	Check
9.4.6 Unit Will Not Terminate Heating		
Unit fails to stop heating	Microprocessor temperature improperly set	Reset
	Microprocessor malfunction	9.6
	Temperature sensor malfunction	8.9.10
9.4.7 Defrost Cycle Malfunction		
Will not initiate defrost automatically	Defrost timer has not expired	Check/Reset
	Defrost air switch (DAS) malfunction	8.8.9
	DTT is above 40°F (4.4°C)	Cool Down
	Loose terminal connections (DAS)	Tighten
Will not initiate defrost manually	Keypad defective	8.4.4
	Loose terminal connections between keypad and microprocessor	Tighten
	DTT is above 40°F (4.4°C)	Cool Down
	Unit has been running less than 15 seconds	Try again
Initiates but does not defrost	Heater contactor or coil defective	Replace
	Heater(s) burned out	8.9.5
	Evaporator fan contactor stuck closed	Check
Frequent defrost	Defrost air switch (DAS) out of adjustment	8.8.9
	Wet load	Normal
Does not terminate or cycles on defrost.	Defrost air switch (DAS) out of adjustment	8.8.9
	DTT malfunction	8.9.10
Refrigerated Compartment	Hot Load	Allow time to pull down
	Defective or insufficient refrigerated compartment insulation or air leak	Correct

INDICATION/ TROUBLE	Possible Causes	Action/Reference Section
9.4.8 Abnormal Pressure		
High discharge pressure	Condenser coil dirty	8.8.2
	Condenser fans rotating backwards	Check Wiring
	Condenser fan inoperative	Check
	Refrigerant overcharge or noncondensibles	8.6.2
	Discharge service valve partially closed	Open
Low discharge pressure	Compressor valves(s) worn or broken	8.7.1
	Low refrigerant charge	8.6.2
	Suction modulation valve malfunction	8.8.5
Low suction pressure	Filter-drier partially plugged	8.8.3
	Low refrigerant charge	8.6.2
	Expansion valve malfunction	9.4.11
	No evaporator air flow or restricted air flow	9.4.10
	Excessive frost on evaporator coil	9.4.7
	Evaporator fan rotating backwards	Check Wiring
	Suction modulation valve malfunction	8.8.5
	Liquid or suction line service valve partially closed	Open
High suction pressure	Compressor valves(s) worn or broken	8.7.1
	Compressor gasket(s) defective	8.7.1
	Heater contactor stuck closed	Check
Suction and discharge pressures tend to equalize when unit is operating	Compressor valves defective	8.7.1
	Compressor gasket(s) defective	8.7.1
9.4.9 Abnormal Noise		
Compressor	Loose mounting bolts	Tighten
	Worn bearings	8.7.1
	Worn or broken valves	8.7.1
	Liquid slugging	9.4.11
	Insufficient oil	8.7.5
Condenser or evaporator fan	Loose or striking shroud	Check
	Bearings defective	8.9.6/8.9.7
	Bent shaft	8.9.6/8.9.7
Water pump belt	Cracked or worn	Replace
9.4.10 No Evaporator Air Flow Or Restricted Air Flow		
Evaporator coil blocked	Frost on coil	8.8.9
	Dirty coil	8.8.1
No or partial evaporator air flow	Evaporator fan loose or defective	8.9.6
	Evaporator fan rotating backwards	8.9.6
	Evaporator air flow blocked	Check

Indication/Trouble	Possible Causes	Action/Reference Section
9.4.11 Evaporator Expansion Valve (EVXV) Malfunction		
EVXV not controlling correctly	Low refrigerant charge	8.6.2
	EVOT defective	8.9.10
	EVOP defective	8.8.8
	Coil not seated properly on valve	Check
	EVXV inlet screen plugged	Check and Replace
	Loose connector	Check and Tighten
9.4.12 Compressor Suction Modulation Valve (CSMV) Malfunction		
CSMV not controlling correctly	Coil not seated properly	Check
	Coil defective	8.8.5
	Loose connector	Check and Tighten
	CST defective	8.9.10
	CSP defective	8.8.8
	CDT defective	8.9.10
	CDP defective	8.8.8

9.5 Speed Control System Diagnostics

Table 9–1 ENSCU LED Fault Chart

	Fault	LED flash code	Diagnostic tree
1	Engine Over Speed: more than 2,530 RPM	One Long–One Short	Figure 9–1
2	No signal from ENSSN for 2 seconds after RPM is greater than 1,000 RPM for 10 seconds, **OR** for 5 seconds while engine cranking (no voltage at ENSCU pin 18).	Two Long–One Short	Figure 9–2
3	Fuel/speed actuator (FSA) wiring disconnected or open circuit. Coil Resistance Spec: 2.8 ohm +/- 10%.	Two Long–Three Short	Figure 9–3
4	ENSCU supply voltage is greater than 26V.	Two Long–Seven Short	Figure 9–4

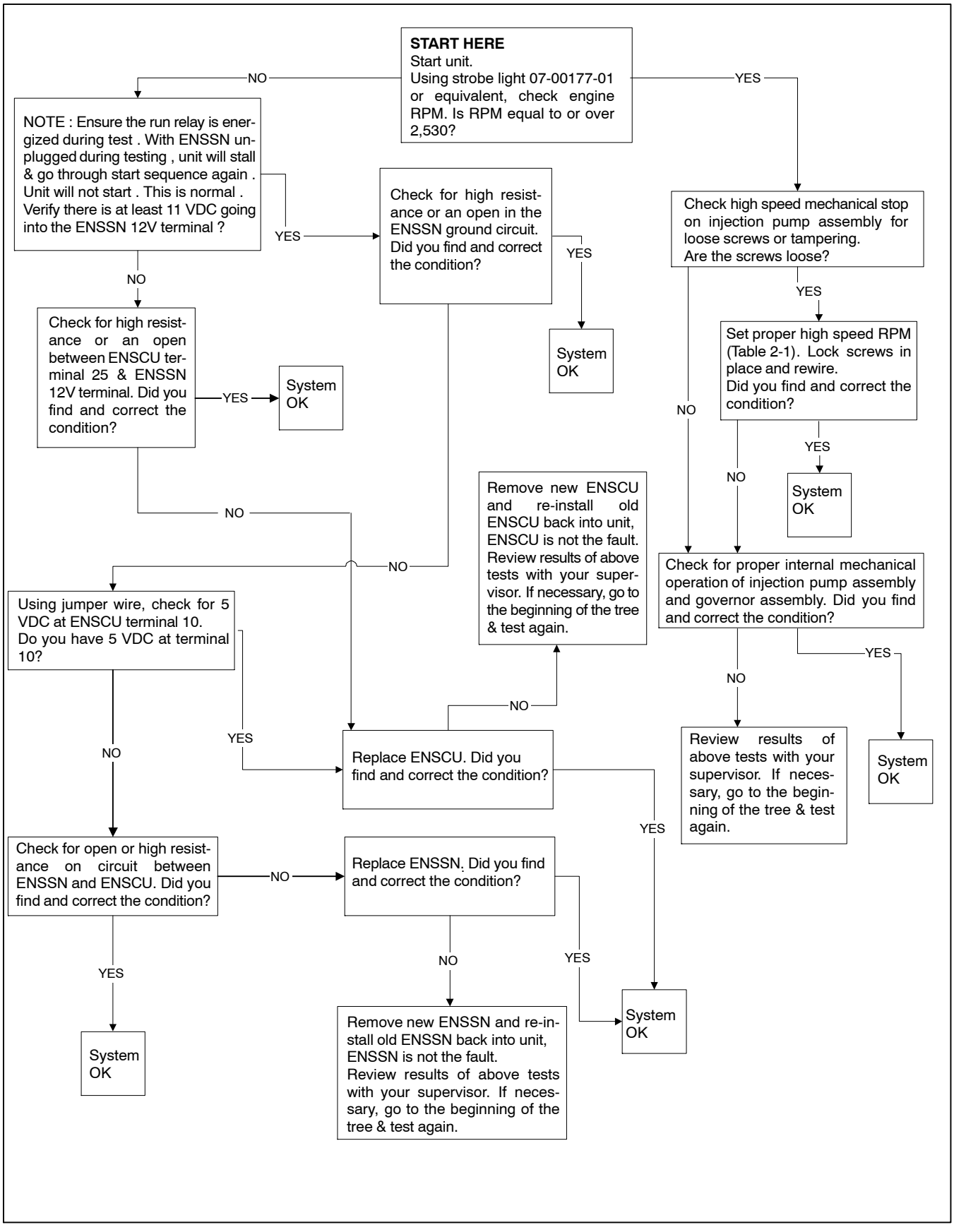

START HERE
Start unit.
Using strobe light 07-00177-01 or equivalent, check engine RPM. Is RPM equal to or over 2,530?
NO
YES
NOTE : Ensure the run relay is energized during test . With ENSSN unplugged during testing , unit will stall & go through start sequence again . Unit will not start . This is normal . Verify there is at least 11 VDC going into the ENSSN 12V terminal ?
YES
NO
Check for high resistance or an open in the ENSSN ground circuit. Did you find and correct the condition?
YES
System OK
Check high speed mechanical stop on injection pump assembly for loose screws or tampering. Are the screws loose?
YES
NO
Set proper high speed RPM (Table 2-1). Lock screws in place and rewire. Did you find and correct the condition?
YES
NO
System OK
Check for high resistance or an open between ENSCU terminal 25 & ENSSN 12V terminal. Did you find and correct the condition?
YES
System OK
NO
NO
Remove new ENSCU and re-install old ENSCU back into unit, ENSCU is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
Check for proper internal mechanical operation of injection pump assembly and governor assembly. Did you find and correct the condition?
YES
NO
Using jumper wire, check for 5 VDC at ENSCU terminal 10. Do you have 5 VDC at terminal 10?
NO
YES
NO
Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
System OK
Replace ENSCU. Did you find and correct the condition?
YES
Check for open or high resistance on circuit between ENSSN and ENSCU. Did you find and correct the condition?
NO
Replace ENSSN. Did you find and correct the condition?
YES
NO
YES
System OK
Remove new ENSSN and re-install old ENSSN back into unit, ENSSN is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
System OK

Figure 9–1 ENSCU Diagnostic Tree - 1 Long, 1 Short LED Code

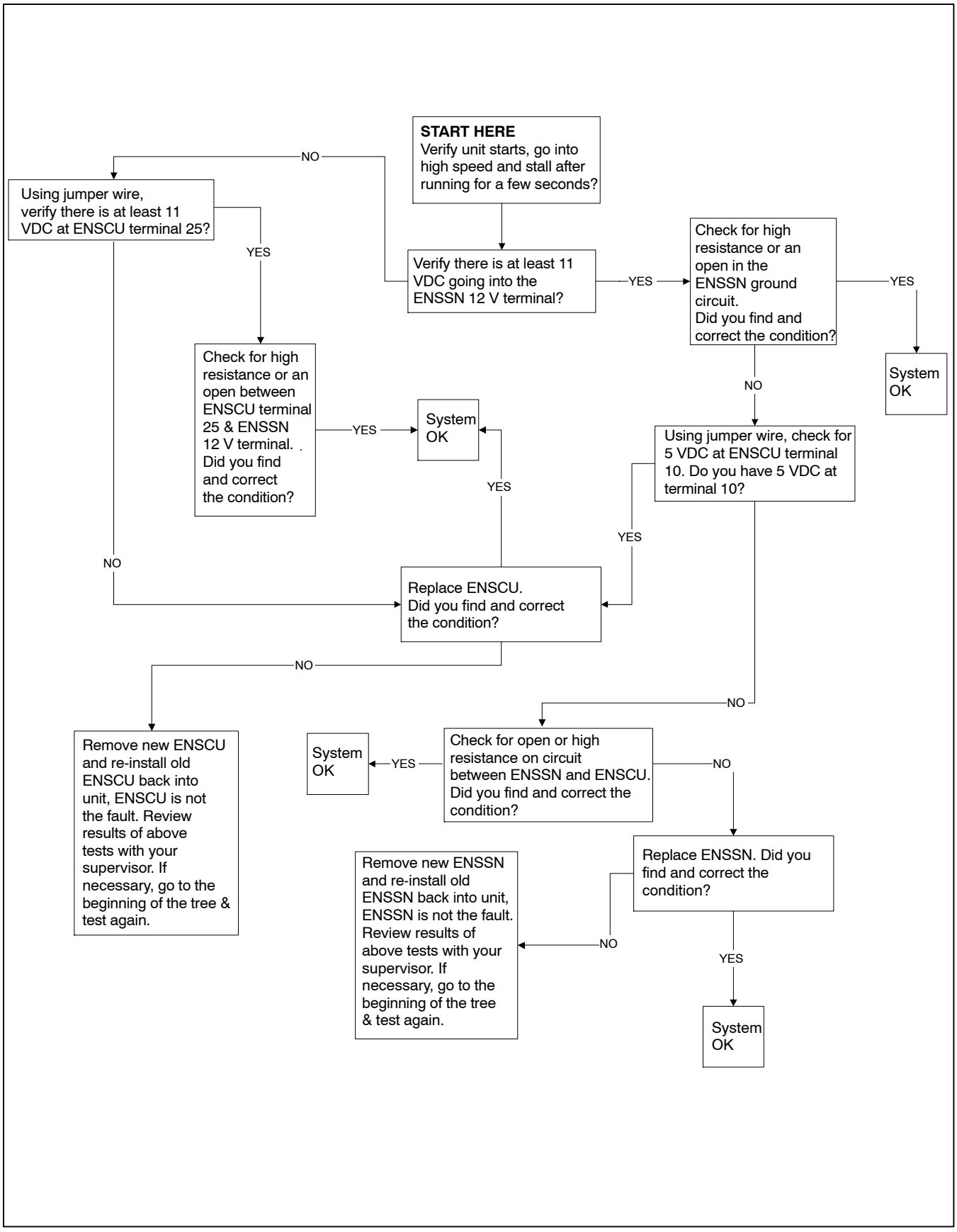

START HERE
Verify unit starts, go into high speed and stall after running for a few seconds?
NO
Using jumper wire, verify there is at least 11 VDC at ENSCU terminal 25?
YES
Verify there is at least 11 VDC going into the ENSSN 12 V terminal?
YES
Check for high resistance or an open in the ENSSN ground circuit. Did you find and correct the condition?
YES
System OK
NO
Check for high resistance or an open between ENSCU terminal 25 & ENSSN 12 V terminal. . Did you find and correct the condition?
YES
System OK
YES
Using jumper wire, check for 5 VDC at ENSCU terminal 10. Do you have 5 VDC at terminal 10?
YES
NO
Replace ENSCU. Did you find and correct the condition?
NO
NO
Remove new ENSCU and re-install old ENSCU back into unit, ENSCU is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
System OK
YES
Check for open or high resistance on circuit between ENSSN and ENSCU. Did you find and correct the condition?
NO
Replace ENSSN. Did you find and correct the condition?
NO
Remove new ENSSN and re-install old ENSSN back into unit, ENSSN is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
YES
System OK

Figure 9–2 ENSCU Diagnostic Tree - 2 Long, 1 Short LED Code

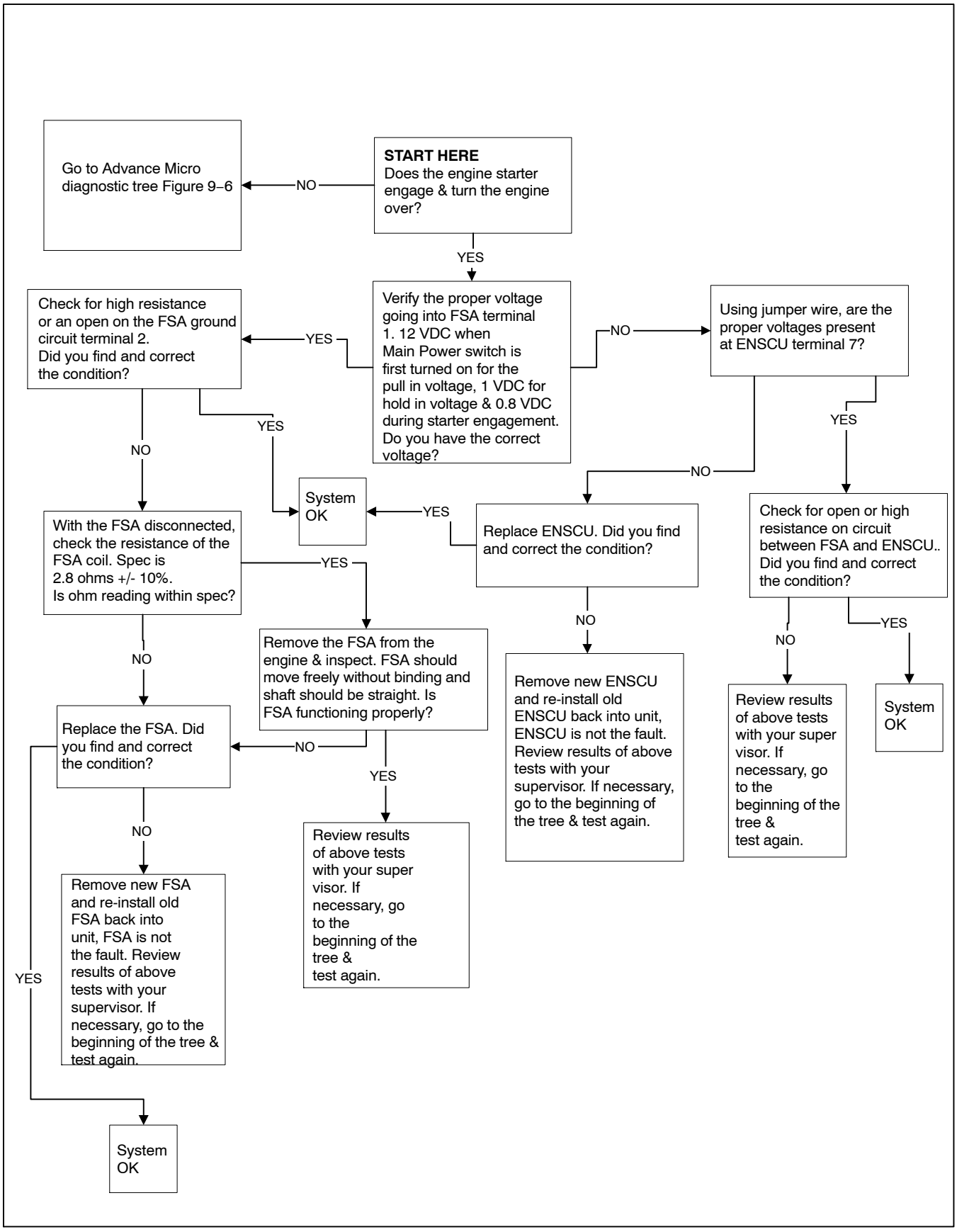

START HERE
Does the engine starter engage & turn the engine over?
NO
Go to Advance Micro diagnostic tree Figure 9–6
YES
Verify the proper voltage going into FSA terminal 1. 12 VDC when Main Power switch is first turned on for the pull in voltage, 1 VDC for hold in voltage & 0.8 VDC during starter engagement. Do you have the correct voltage?
YES
Check for high resistance or an open on the FSA ground circuit terminal 2. Did you find and correct the condition?
NO
Using jumper wire, are the proper voltages present at ENSCU terminal 7?
YES
NO
YES
System OK
YES
Replace ENSCU. Did you find and correct the condition?
NO
Remove new ENSCU and re-install old ENSCU back into unit, ENSCU is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
Check for open or high resistance on circuit between FSA and ENSCU.. Did you find and correct the condition?
NO
Review results of above tests with your super visor. If necessary, go to the beginning of the tree & test again.
YES
System OK
With the FSA disconnected, check the resistance of the FSA coil. Spec is 2.8 ohms +/- 10%. Is ohm reading within spec?
YES
NO
Remove the FSA from the engine & inspect. FSA should move freely without binding and shaft should be straight. Is FSA functioning properly?
NO
YES
Review results of above tests with your super visor. If necessary, go to the beginning of the tree & test again.
Replace the FSA. Did you find and correct the condition?
NO
Remove new FSA and re-install old FSA back into unit, FSA is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
YES
System OK

Figure 9–3 ENSCU Diagnostic Tree - 2 Long, 3 Short LED Code

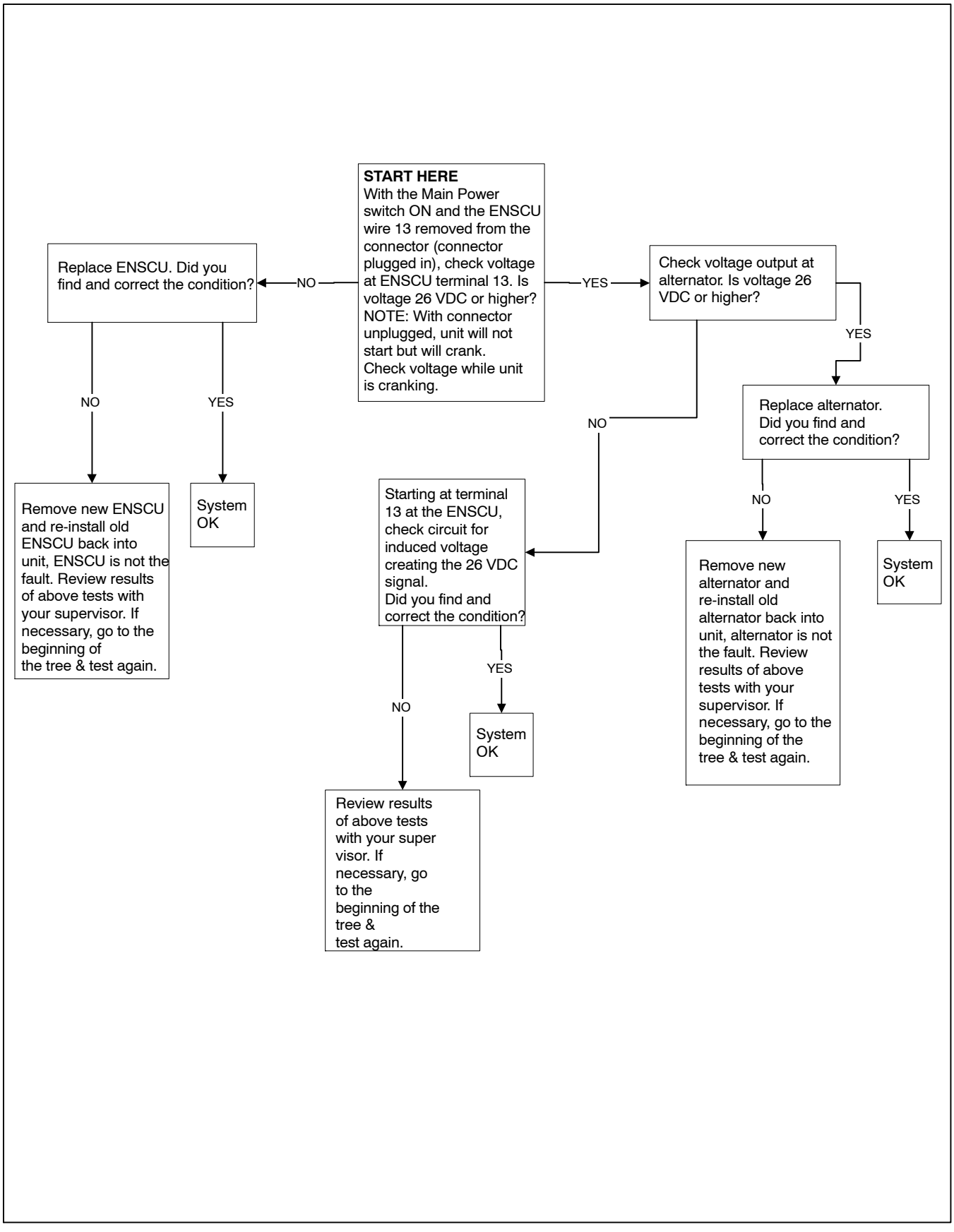

START HERE
With the Main Power switch ON and the ENSCU wire 13 removed from the connector (connector plugged in), check voltage at ENSCU terminal 13. Is voltage 26 VDC or higher?
NOTE: With connector unplugged, unit will not start but will crank. Check voltage while unit is cranking.
NO
YES
Replace ENSCU. Did you find and correct the condition?
NO
YES
Remove new ENSCU and re-install old ENSCU back into unit, ENSCU is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
System OK
Check voltage output at alternator. Is voltage 26 VDC or higher?
YES
NO
Replace alternator. Did you find and correct the condition?
NO
YES
Remove new alternator and re-install old alternator back into unit, alternator is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
System OK
Starting at terminal 13 at the ENSCU, check circuit for induced voltage creating the 26 VDC signal.
Did you find and correct the condition?
YES
NO
System OK
Review results of above tests with your super visor. If necessary, go to the beginning of the tree & test again.

Figure 9–4 ENSCU Diagnostic Tree - 2 Long, 7 Short LED Code

9.6 Microprocessor Diagnostics

The purpose of the following procedure is to provide a logical and straightforward guide to be used when diagnosing operational or other problems occurring with the microprocessor. Often users and technicians have mistakenly worked to correct a problem that has ended up being normal operation. The microprocessor has several different conditions contributing to operating parameters. These conditions are called out in the various diagnostic charts to aid the technician in pinpointing the problem, or in realizing that the unit is performing normally.

When using these trees, it is important to verify the reported symptom or problem and then correctly identify the appropriate tree for that particular condition. Using the incorrect tree will lead to an incorrect diagnosis.

When using these diagnostic trees, it is very important not to skip any steps. Follow the flow of the trees in the order that they are laid out. These trees are formatted into a logical diagnostic sequence. Skipping around the trees will most likely lead to errors in diagnosis.

Throughout the trees, the steps will point the technician to areas to look at or check for a problem. Most of the steps will lead the technician to a circuit or other area of the unit to check, test, and possibly repair other than the microprocessor. Some steps will point to a possible problem with the microprocessor. Whenever reaching one of these steps, it is a very good practice to install the new microprocessor, then verify unit operation PRIOR TO writing hours, Trailer ID, Unit Serial Number, etc., into the new microprocessor. Once the technician is satisfied that a new microprocessor is required, the hours, trailer ID, unit serial number, customer configurations, etc., should be entered. Should the problem remain even with the new microprocessor in place, once all repairs are made, the original microprocessor is to be reinstalled into the unit, to avoid unnecessary costs to the customer or having the Warranty Request rejected if there is no problem found with the returned microprocessor.

All steps leading to replacement of the microprocessor have a number associated with them. When filling out the MPR tag that will be attached to the returned part, write the step number on the upper half of the tag in the Failure Description Field. Include the same information in the Failure Description Field when entering the warranty claim information on line. This will show which diagnostic tree was used and the path that was followed to determine the micro was at fault.

Refer to the following table to identify the correct tree to use.

Table 9–2 Microprocessor Diagnostics

Condition	Description	Diagnostic tree
1	Main Power switch On - Unit Does Not Operate	Figure 9–5
2	Main Power switch On - Unit Operates But Not Properly	Figure 9–6
3	Main Power switch Off - Unit Fails To Stop	Figure 9–7
4	Unit Will Not Run In High Speed	Figure 9–8
5	Unit Will Not Run In Low Speed	Figure 9–9
6	DataLink Data Recorder Data Download Problems When Using ReeferManager and a Download Cable. Data File Analysis Problems Using Reports	Figure 9–10
7	PC Card Problems	Figure 9–11
8	Programming Problems With PC Cards	Figure 9–12

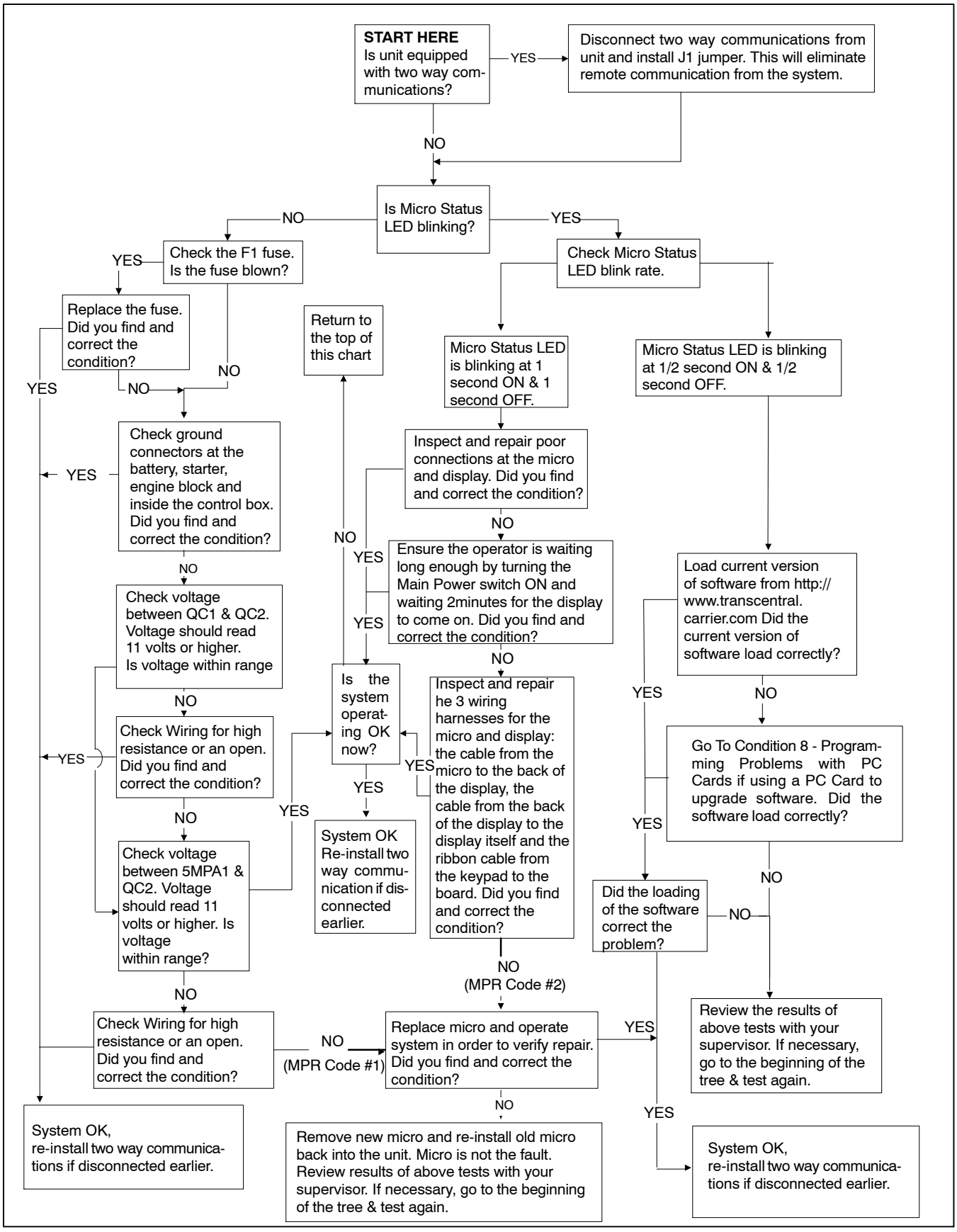

START HERE
Is unit equipped with two way communications?
YES
Disconnect two way communications from unit and install J1 jumper. This will eliminate remote communication from the system.
NO
Is Micro Status LED blinking?
NO
YES
Check the F1 fuse. Is the fuse blown?
YES
Replace the fuse. Did you find and correct the condition?
YES
NO
NO
Check ground connectors at the battery, starter, engine block and inside the control box. Did you find and correct the condition?
YES
NO
Check voltage between QC1 & QC2. Voltage should read 11 volts or higher. Is voltage within range
NO
Check Wiring for high resistance or an open. Did you find and correct the condition?
YES
NO
Check voltage between 5MPA1 & QC2. Voltage should read 11 volts or higher. Is voltage within range?
NO
Check Wiring for high resistance or an open. Did you find and correct the condition?
NO
(MPR Code #1)
System OK, re-install two way communications if disconnected earlier.
Return to the top of this chart
Check Micro Status LED blink rate.
Micro Status LED is blinking at 1 second ON & 1 second OFF.
Inspect and repair poor connections at the micro and display. Did you find and correct the condition?
NO
YES
Ensure the operator is waiting long enough by turning the Main Power switch ON and waiting 2minutes for the display to come on. Did you find and correct the condition?
YES
NO
Is the system operating OK now?
YES
NO
YES
System OK Re-install two way communication if disconnected earlier.
Inspect and repair he 3 wiring harnesses for the micro and display: the cable from the micro to the back of the display, the cable from the back of the display to the display itself and the ribbon cable from the keypad to the board. Did you find and correct the condition?
NO
(MPR Code #2)
Replace micro and operate system in order to verify repair. Did you find and correct the condition?
NO
Remove new micro and re-install old micro back into the unit. Micro is not the fault. Review results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
Micro Status LED is blinking at 1/2 second ON & 1/2 second OFF.
Load current version of software from http://www.transcentral.carrier.com Did the current version of software load correctly?
YES
NO
Go To Condition 8 - Programming Problems with PC Cards if using a PC Card to upgrade software. Did the software load correctly?
YES
NO
Did the loading of the software correct the problem?
NO
YES
Review the results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
YES
System OK, re-install two way communications if disconnected earlier.

Figure 9–5 Micro Diagnostic Tree - Condition 1 - Main Power Switch On - Unit Does Not Operate

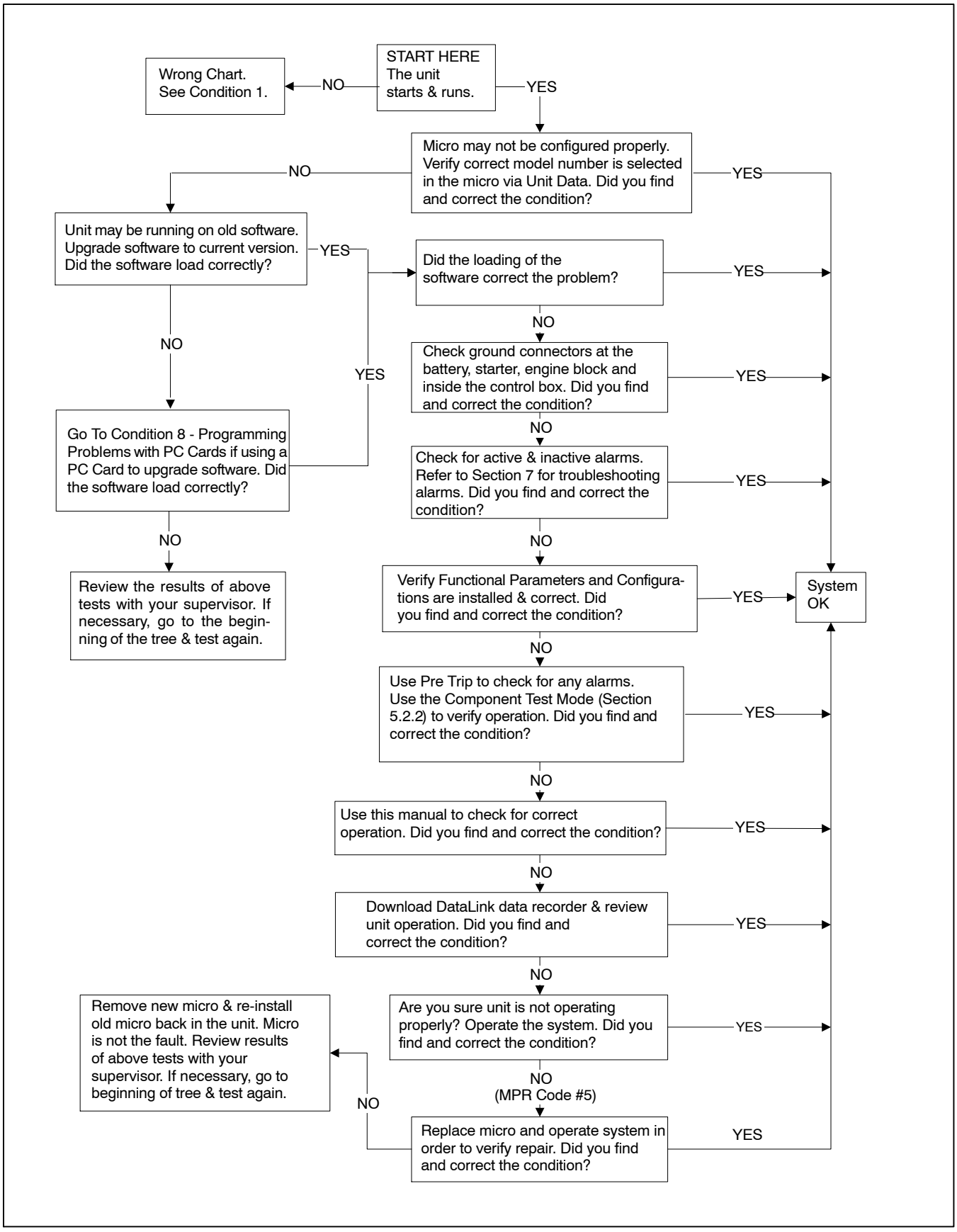


Figure 9–6 Micro Diagnostic Tree - Condition 2 - Main Power Switch On - Unit Operates But Not Properly

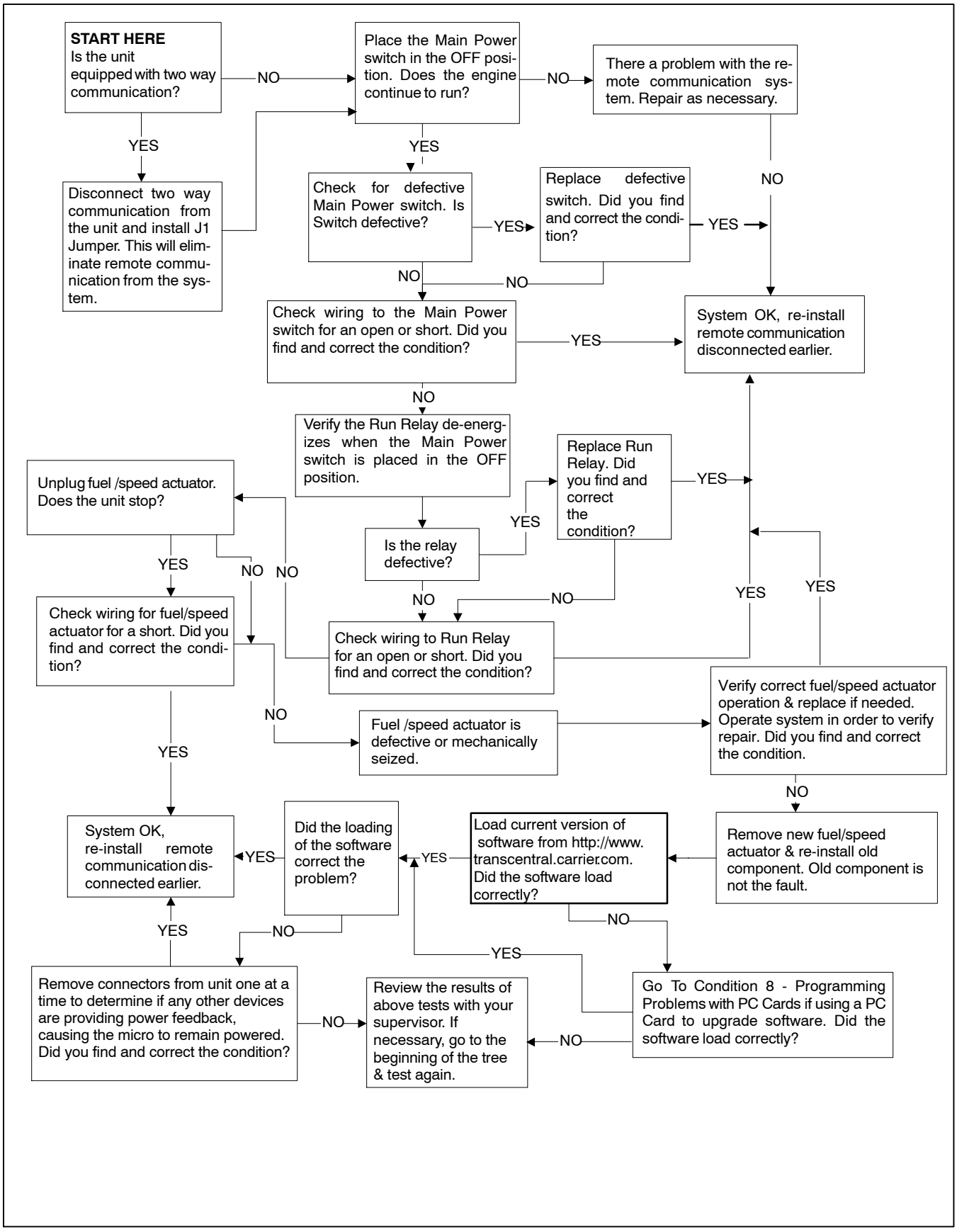

START HERE
Is the unit equipped with two way communication?
NO
YES
Disconnect two way communication from the unit and install J1 Jumper. This will eliminate remote communication from the system.
Place the Main Power switch in the OFF position. Does the engine continue to run?
NO
There a problem with the remote communication system. Repair as necessary.
YES
Check for defective Main Power switch. Is Switch defective?
YES
Replace defective switch. Did you find and correct the condition?
YES
NO
NO
NO
Check wiring to the Main Power switch for an open or short. Did you find and correct the condition?
YES
System OK, re-install remote communication disconnected earlier.
NO
Verify the Run Relay de-energizes when the Main Power switch is placed in the OFF position.
Replace Run Relay. Did you find and correct the condition?
YES
Unplug fuel /speed actuator. Does the unit stop?
YES
NO
NO
Is the relay defective?
YES
NO
NO
Check wiring for fuel/speed actuator for a short. Did you find and correct the condition?
Check wiring to Run Relay for an open or short. Did you find and correct the condition?
YES
YES
NO
Fuel /speed actuator is defective or mechanically seized.
Verify correct fuel/speed actuator operation & replace if needed. Operate system in order to verify repair. Did you find and correct the condition.
YES
NO
System OK, re-install remote communication disconnected earlier.
YES
Did the loading of the software correct the problem?
YES
Load current version of software from http://www.transcentral.carrier.com. Did the software load correctly?
Remove new fuel/speed actuator & re-install old component. Old component is not the fault.
YES
NO
NO
YES
Remove connectors from unit one at a time to determine if any other devices are providing power feedback, causing the micro to remain powered. Did you find and correct the condition?
NO
Review the results of above tests with your supervisor. If necessary, go to the beginning of the tree & test again.
NO
Go To Condition 8 - Programming Problems with PC Cards if using a PC Card to upgrade software. Did the software load correctly?

Figure 9–7 Micro Diagnostic Tree - Condition 3 - Main Power Switch Off - Unit Fails To Stop

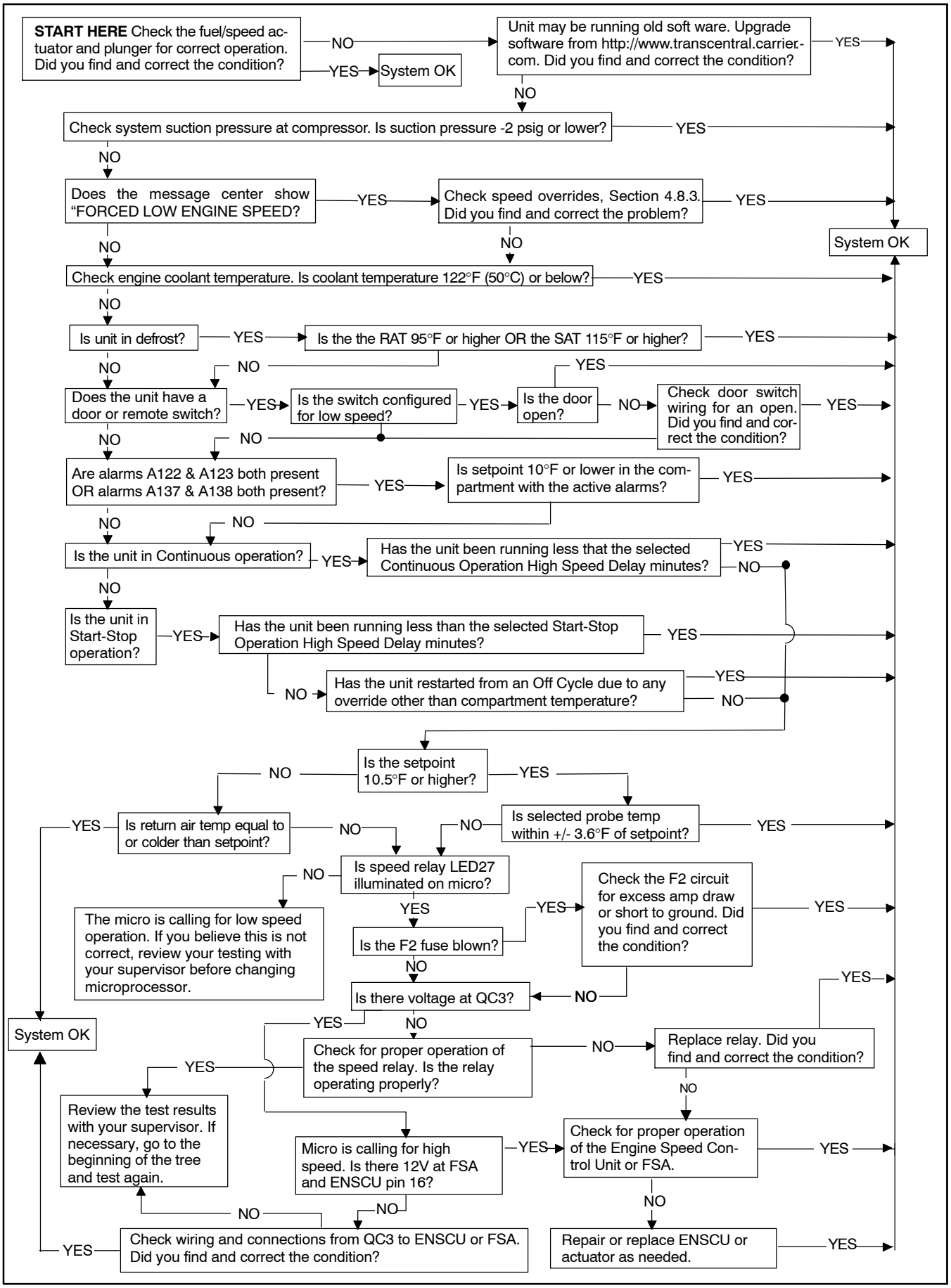

START HERE Check the fuel/speed actuator and plunger for correct operation. Did you find and correct the condition?
NO
YES
System OK
Unit may be running old soft ware. Upgrade software from http://www.transcentral.carrier.com. Did you find and correct the condition?
YES
NO
Check system suction pressure at compressor. Is suction pressure -2 psig or lower?
YES
NO
Does the message center show "FORCED LOW ENGINE SPEED?
YES
Check speed overrides, Section 4.8.3. Did you find and correct the problem?
YES
NO
System OK
Check engine coolant temperature. Is coolant temperature 122°F (50°C) or below?
YES
NO
Is unit in defrost?
YES
Is the the RAT 95°F or higher OR the SAT 115°F or higher?
YES
NO
NO
YES
Does the unit have a door or remote switch?
YES
Is the switch configured for low speed?
YES
Is the door open?
NO
Check door switch wiring for an open. Did you find and correct the condition?
YES
NO
NO
Are alarms A122 & A123 both present OR alarms A137 & A138 both present?
YES
Is setpoint 10°F or lower in the compartment with the active alarms?
YES
NO
NO
Is the unit in Continuous operation?
YES
Has the unit been running less that the selected Continuous Operation High Speed Delay minutes?
YES
NO
NO
Is the unit in Start-Stop operation?
YES
Has the unit been running less than the selected Start-Stop Operation High Speed Delay minutes?
YES
NO
Has the unit restarted from an Off Cycle due to any override other than compartment temperature?
YES
NO
Is the setpoint 10.5°F or higher?
NO
YES
Is return air temp equal to or colder than setpoint?
YES
NO
Is selected probe temp within +/- 3.6°F of setpoint?
NO
YES
Is speed relay LED27 illuminated on micro?
NO
YES
The micro is calling for low speed operation. If you believe this is not correct, review your testing with your supervisor before changing microprocessor.
Is the F2 fuse blown?
YES
Check the F2 circuit for excess amp draw or short to ground. Did you find and correct the condition?
YES
NO
Is there voltage at QC3?
NO
YES
NO
System OK
Check for proper operation of the speed relay. Is the relay operating properly?
YES
NO
Replace relay. Did you find and correct the condition?
YES
NO
Review the test results with your supervisor. If necessary, go to the beginning of the tree and test again.
Micro is calling for high speed. Is there 12V at FSA and ENSCU pin 16?
YES
Check for proper operation of the Engine Speed Control Unit or FSA.
YES
NO
NO
NO
Check wiring and connections from QC3 to ENSCU or FSA. Did you find and correct the condition?
YES
Repair or replace ENSCU or actuator as needed.
YES

Figure 9–8 Micro Diagnostic Tree - Condition 4 - Unit Will Not Run In High Speed

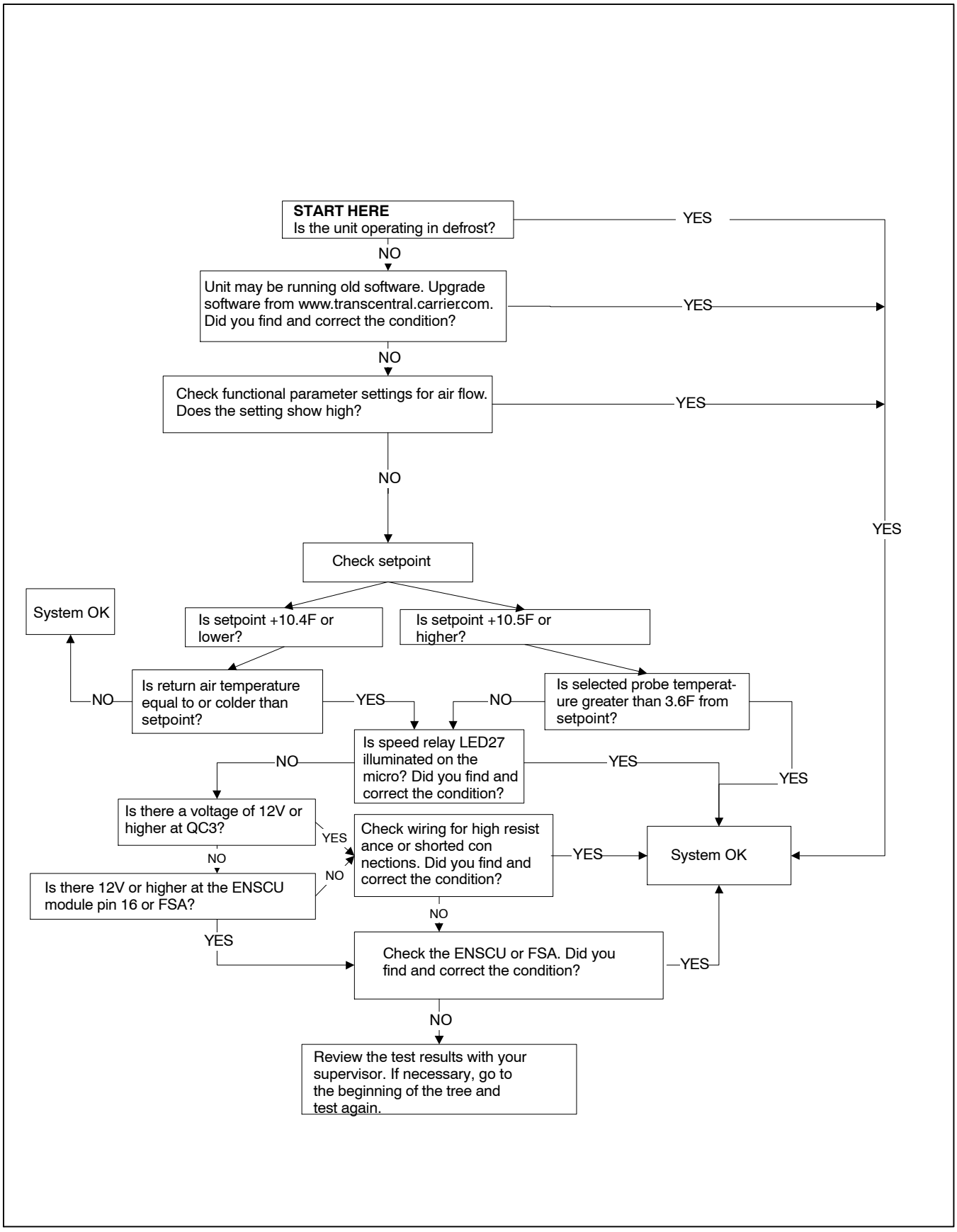

START HERE
Is the unit operating in defrost?
YES
NO
Unit may be running old software. Upgrade software from www.transcentral.carrier.com. Did you find and correct the condition?
YES
NO
Check functional parameter settings for air flow. Does the setting show high?
YES
NO
YES
Check setpoint
System OK
Is setpoint +10.4F or lower?
Is setpoint +10.5F or higher?
NO
Is return air temperature equal to or colder than setpoint?
YES
NO
Is selected probe temperature greater than 3.6F from setpoint?
Is speed relay LED27 illuminated on the micro? Did you find and correct the condition?
NO
YES
YES
Is there a voltage of 12V or higher at QC3?
YES
NO
Is there 12V or higher at the ENSCU module pin 16 or FSA?
NO
Check wiring for high resistance or shorted connections. Did you find and correct the condition?
YES
System OK
NO
YES
Check the ENSCU or FSA. Did you find and correct the condition?
YES
NO
Review the test results with your supervisor. If necessary, go to the beginning of the tree and test again.

Figure 9–9 Micro Diagnostic Tree - Condition 5 - Unit Will Not Run In Low Speed

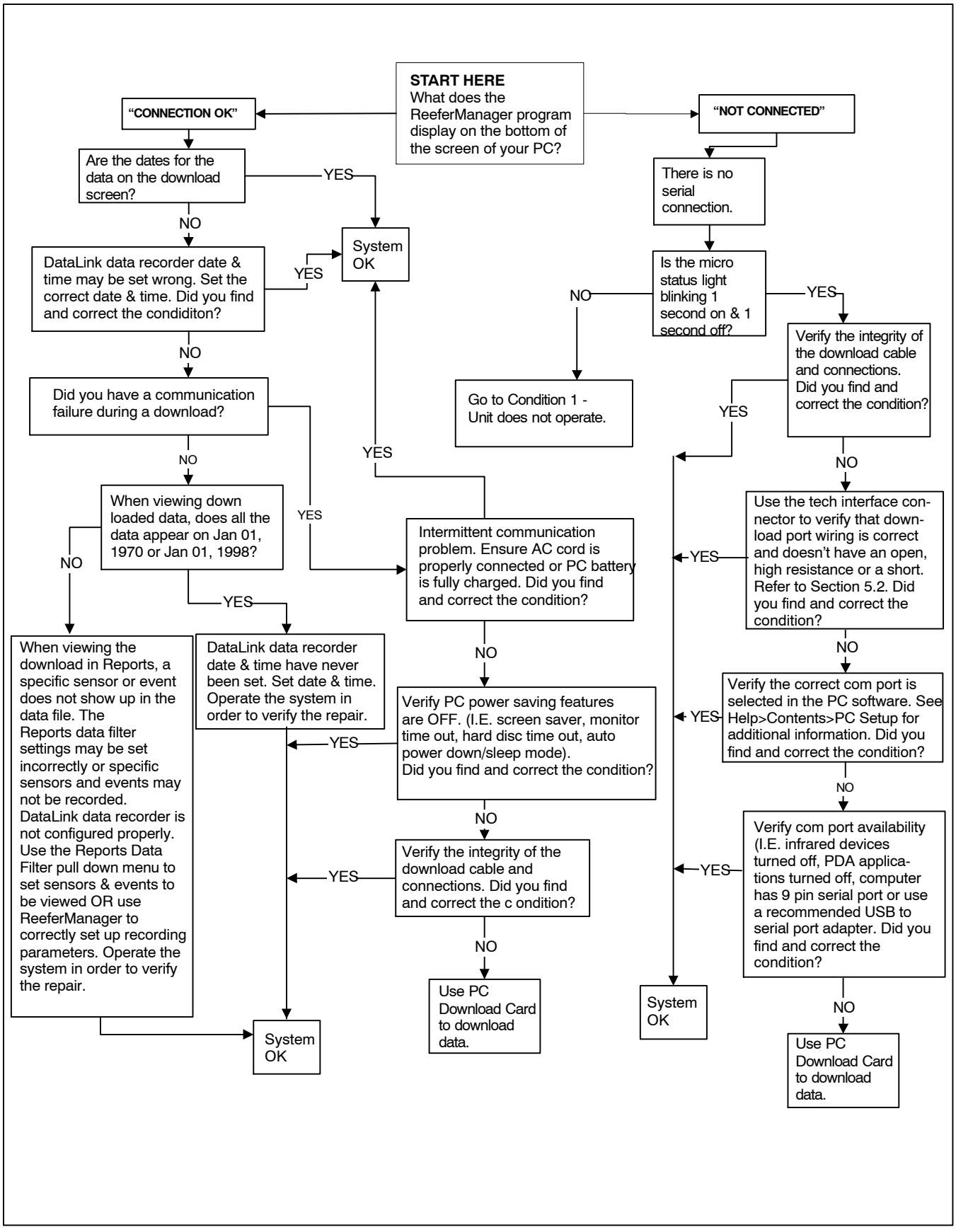

START HERE
What does the ReeferManager program display on the bottom of the screen of your PC?
"CONNECTION OK"
"NOT CONNECTED"
Are the dates for the data on the download screen?
YES
NO
System OK
DataLink data recorder date & time may be set wrong. Set the correct date & time. Did you find and correct the condiditon?
YES
NO
Did you have a communication failure during a download?
YES
NO
When viewing down loaded data, does all the data appear on Jan 01, 1970 or Jan 01, 1998?
YES
NO
When viewing the download in Reports, a specific sensor or event does not show up in the data file. The Reports data filter settings may be set incorrectly or specific sensors and events may not be recorded. DataLink data recorder is not configured properly. Use the Reports Data Filter pull down menu to set sensors & events to be viewed OR use ReeferManager to correctly set up recording parameters. Operate the system in order to verify the repair.
DataLink data recorder date & time have never been set. Set date & time. Operate the system in order to verify the repair.
YES
System OK
Intermittent communication problem. Ensure AC cord is properly connected or PC battery is fully charged. Did you find and correct the condition?
YES
NO
Verify PC power saving features are OFF. (I.E. screen saver, monitor time out, hard disc time out, auto power down/sleep mode). Did you find and correct the condition?
YES
NO
Verify the integrity of the download cable and connections. Did you find and correct the c ondition?
YES
NO
Use PC Download Card to download data.
There is no serial connection.
Is the micro status light blinking 1 second on & 1 second off?
NO
YES
Go to Condition 1 - Unit does not operate.
Verify the integrity of the download cable and connections. Did you find and correct the condition?
YES
NO
Use the tech interface connector to verify that download port wiring is correct and doesn't have an open, high resistance or a short. Refer to Section 5.2. Did you find and correct the condition?
YES
NO
Verify the correct com port is selected in the PC software. See Help>Contents>PC Setup for additional information. Did you find and correct the condition?
YES
NO
Verify com port availability (I.E. infrared devices turned off, PDA applications turned off, computer has 9 pin serial port or use a recommended USB to serial port adapter. Did you find and correct the condition?
YES
NO
Use PC Download Card to download data.
System OK

Figure 9–10 Micro Diagnostic Tree - Condition 6 - DataLink Data Recorder Data Download Problems When Using ReeferManager and a Download Cable. Data File Analysis Problems Using Reports

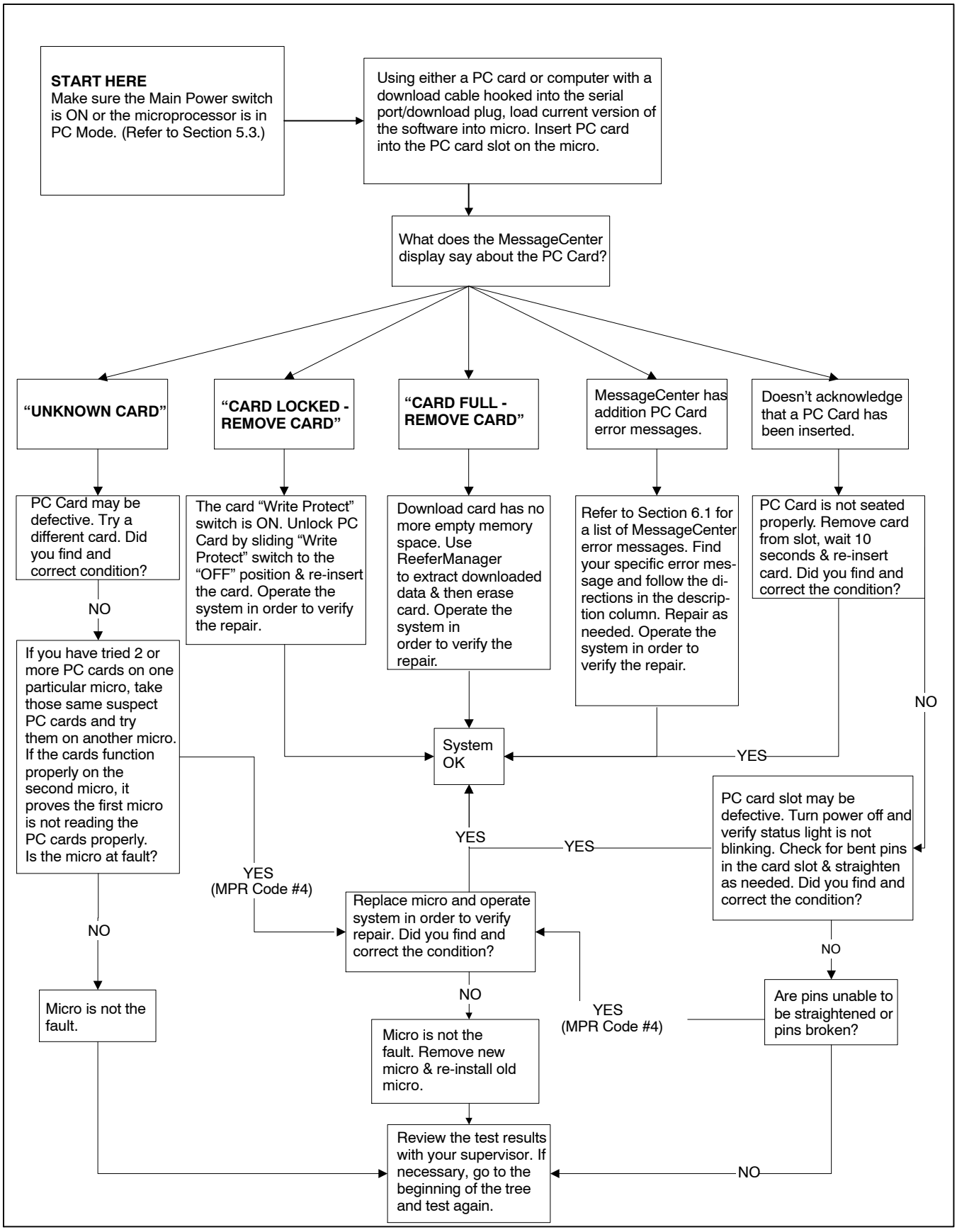

START HERE
Make sure the Main Power switch is ON or the microprocessor is in PC Mode. (Refer to Section 5.3.)
Using either a PC card or computer with a download cable hooked into the serial port/download plug, load current version of the software into micro. Insert PC card into the PC card slot on the micro.
What does the MessageCenter display say about the PC Card?
"UNKNOWN CARD"
"CARD LOCKED - REMOVE CARD"
"CARD FULL - REMOVE CARD"
MessageCenter has addition PC Card error messages.
Doesn't acknowledge that a PC Card has been inserted.
PC Card may be defective. Try a different card. Did you find and correct condition?
The card "Write Protect" switch is ON. Unlock PC Card by sliding "Write Protect" switch to the "OFF" position & re-insert the card. Operate the system in order to verify the repair.
Download card has no more empty memory space. Use ReeferManager to extract downloaded data & then erase card. Operate the system in order to verify the repair.
Refer to Section 6.1 for a list of MessageCenter error messages. Find your specific error message and follow the directions in the description column. Repair as needed. Operate the system in order to verify the repair.
PC Card is not seated properly. Remove card from slot, wait 10 seconds & re-insert card. Did you find and correct the condition?
NO
NO
If you have tried 2 or more PC cards on one particular micro, take those same suspect PC cards and try them on another micro. If the cards function properly on the second micro, it proves the first micro is not reading the PC cards properly. Is the micro at fault?
System OK
YES
YES
YES
PC card slot may be defective. Turn power off and verify status light is not blinking. Check for bent pins in the card slot & straighten as needed. Did you find and correct the condition?
YES (MPR Code #4)
Replace micro and operate system in order to verify repair. Did you find and correct the condition?
NO
NO
Micro is not the fault.
NO
Micro is not the fault. Remove new micro & re-install old micro.
YES (MPR Code #4)
Are pins unable to be straightened or pins broken?
Review the test results with your supervisor. If necessary, go to the beginning of the tree and test again.
NO

Figure 9–11 Microprocessor Diagnostic Tree - Condition 7 - PC Card Problems

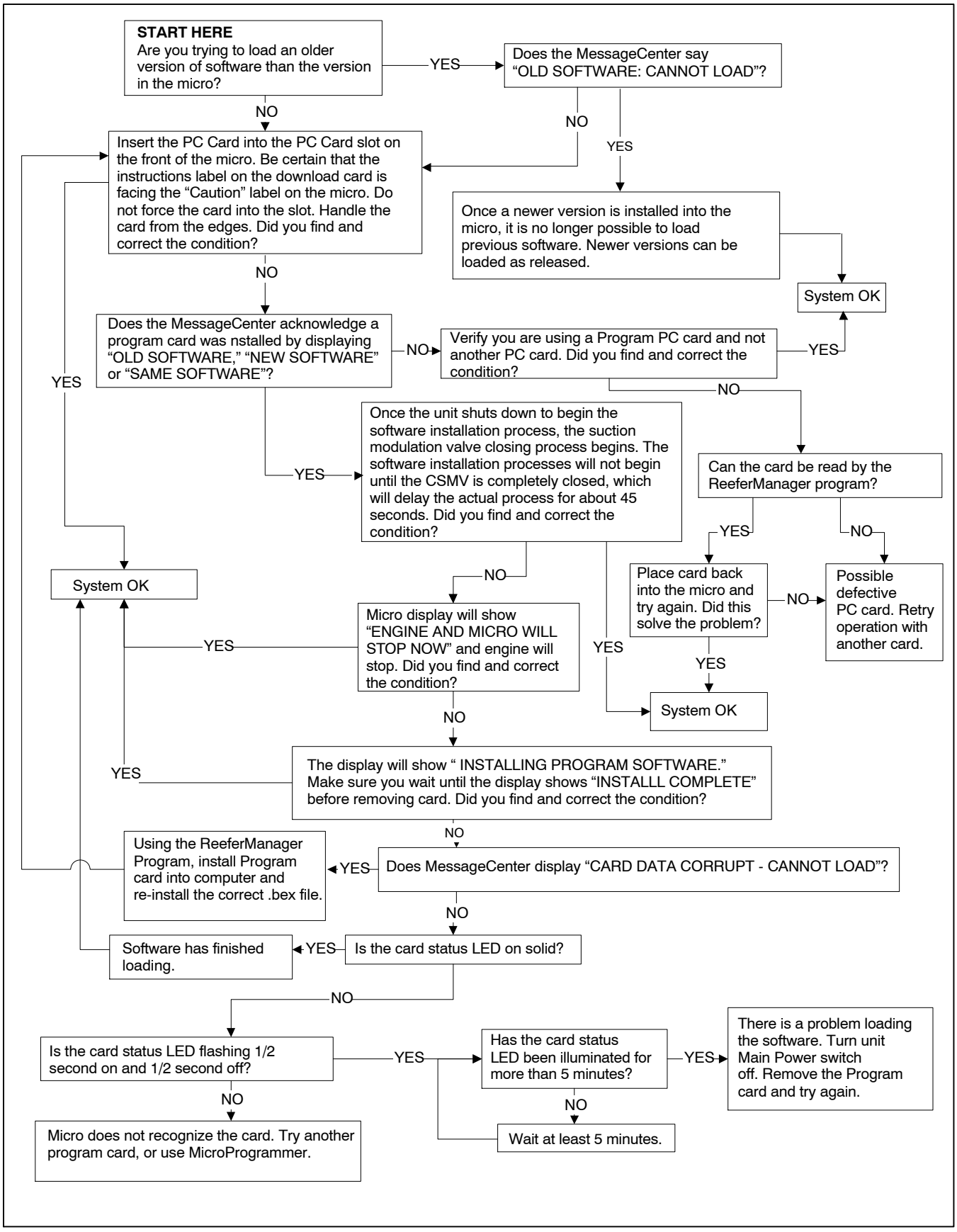

START HERE
Are you trying to load an older version of software than the version in the micro?
YES
Does the MessageCenter say "OLD SOFTWARE: CANNOT LOAD"?
NO
YES
NO
Insert the PC Card into the PC Card slot on the front of the micro. Be certain that the instructions label on the download card is facing the "Caution" label on the micro. Do not force the card into the slot. Handle the card from the edges. Did you find and correct the condition?
Once a newer version is installed into the micro, it is no longer possible to load previous software. Newer versions can be loaded as released.
System OK
NO
Does the MessageCenter acknowledge a program card was nstalled by displaying "OLD SOFTWARE," "NEW SOFTWARE" or "SAME SOFTWARE"?
NO
Verify you are using a Program PC card and not another PC card. Did you find and correct the condition?
YES
YES
NO
YES
Once the unit shuts down to begin the software installation process, the suction modulation valve closing process begins. The software installation processes will not begin until the CSMV is completely closed, which will delay the actual process for about 45 seconds. Did you find and correct the condition?
Can the card be read by the ReeferManager program?
YES
NO
System OK
NO
Place card back into the micro and try again. Did this solve the problem?
NO
Possible defective PC card. Retry operation with another card.
Micro display will show "ENGINE AND MICRO WILL STOP NOW" and engine will stop. Did you find and correct the condition?
YES
YES
YES
System OK
NO
YES
The display will show " INSTALLING PROGRAM SOFTWARE." Make sure you wait until the display shows "INSTALLL COMPLETE" before removing card. Did you find and correct the condition?
NO
Using the ReeferManager Program, install Program card into computer and re-install the correct .bex file.
YES
Does MessageCenter display "CARD DATA CORRUPT - CANNOT LOAD"?
NO
Software has finished loading.
YES
Is the card status LED on solid?
NO
Is the card status LED flashing 1/2 second on and 1/2 second off?
YES
Has the card status LED been illuminated for more than 5 minutes?
YES
There is a problem loading the software. Turn unit Main Power switch off. Remove the Program card and try again.
NO
NO
Micro does not recognize the card. Try another program card, or use MicroProgrammer.
Wait at least 5 minutes.

Figure 9–12 Micro Diagnostic Tree - Condition 8 - Programming Problems With PC Cards

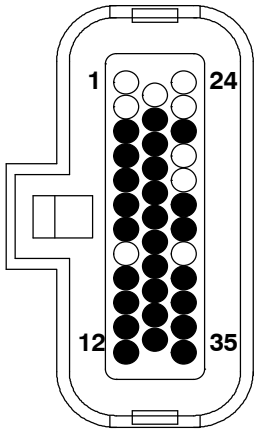
SECTION 10 – WIRING

PARAGRAPH NUMBER		Page
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SECTION 10
WIRING

10.1 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/ STANDBY

1MP - NATURAL

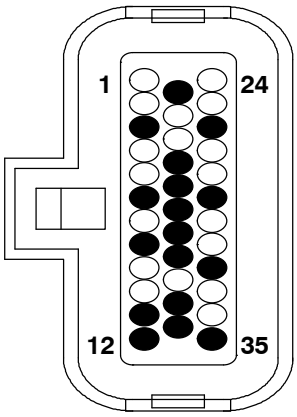


Component	Terminal
REMSN1 (REMSN-E)	3 (14)
REMSN2 (REMSN-H)	4 (14)
CDP-3	5 (16) (30)
EVOP-3 (DP16-S)	6 (17) (30)
ENCT	7 (18)
CDT	9 (20)
CST	10 (19)
AAT	11 (22)
1RAT (DP16-H)	12 (23)
REMSN1 (REMSN-F) (SP1)	14 (3)
REMSN2 (REMSN-G) (SP1)	14 (4)
REMSN3 (REMSN-K) (SP1)	14 (33)

1MP - NATURAL (Continued)

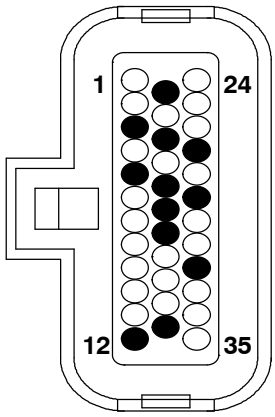
Component	Terminal
CSP-1 (SP16)	15 (29) (30)
OGF-OV (HC-1) (SP16)	15
CDP-1	16 (5) (30)
EVOP-1 (DP16-P)	17 (6) (30)
ENCT	18 (7)
CST (SP14)	19 (10)
EVOT (DP16-F) (SP14)	19 (32)
CDT	20 (9)
1DTT (DP16-B)	21 (34)
AAT	22 (11)
1SAT (DP16-D) (SP12)	23 (35)
1RAT (DP16-G) (SP12)	23 (12)
FLS-C	26
CSP-3	29 (15) (30)
CSP-2 (SP7)	30 (15) (29)
CDP-2 (SP7)	30 (5) (16)
EVOP-2 (SP7) (DP16-R)	30 (6) (17)
EVOT (DP16-E)	32 (19)
REMSN3 (REMSN-J)	33 (14)
1DTT (DP16-A)	34 (21)
1SAT (DP16-C)	35 (23)
Unused terminals: 1, 2,8,13, 24, 25, 27,28,31	

2 MP - Black



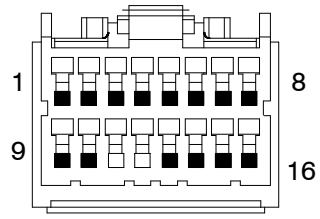
Component	Terminal
REMSN-C	3
DAS	6
CSMV-D	8 (19) (20) (32)
EVXV-B (DP16-K)	11 (12) (22) (23) (35)
EVXV-E (DP16-N)	12 (11) (22) (23) (35)
REMSN-D	13
DS-B	16
ENOPS	17
ENSCU-3	18
CSMV-C	19 (8) (20) (32)
CSMV-A	20 (8) (19) (32)
EVXV-D (DP16-M)	22 (11) (12) (23) (35)
EVXV-A (DP16-J)	23 (11) (12) (22) (35)
HC19 (SP61)	26
ENOLS	28
SP15	29
CSMV-B	32 (8) (19) (20)
EVXV-C (DP16-L)	35 (11) (12) (22) (23)
Unused terminals: 1,2,4,5,7,9,10,14,15,21, 24, 25, 27, 30, 31, 33, 34	

3 MP - Grey



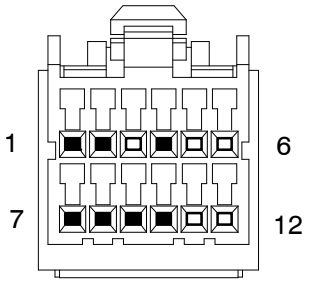
Component	Terminal
SATCOM-C (GND)	3 (15) (27)
SLP-C (GND)	5 (13)(17) (29)
UL1	12
SLP-E	13 (5) (17) (29)
SATCOM-B (RX)	15 (3) (27)
SLP-A (RX)	17 (5) (13) (29)
LB-H (AMBER)	19 (32)
UL2	23
SATCOM-A (TX)	27 (3) (15)
SLP-B (TX)	29 (5) (13) (17)
LB-B (GREEN)	32 (19)
Unused terminals: 1,2,4,6,7,8,9,10,11,14,16,18,20,21,22, 24, 25, 26,28,30, 31,33,34 35	

4 MP



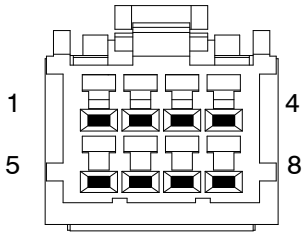
Component	Terminal
CCONR-1 (SP60)	1
CDCON-A2	2
1EVCON-A2	3
SP55	4
CCONR-2	5
CDCON-A1	6
GENCONR-2	7
CT BROWN/OGF BROWN (SP54)	8
CT BLACK	9
CT BLUE/OGF BLUE (SP53)	10
1HTCON1-A1	13
1HTCON2-A1	14
1EVCON-A1	15
FHR-2	16
Unused terminals: 11, 12.	

5 MP



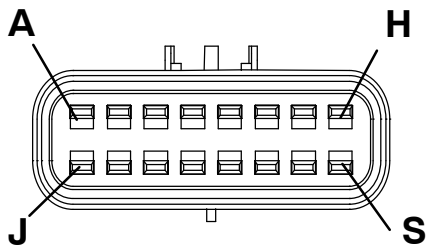
Component	Terminal
SP52	1
SP56	2
PRM-OUT+	4
PSCONR-2	7
BUZZER -	8
IAHR-85	9
SSR-85	10
Unused terminals: 3, 5, 6, 11, 12	

6 MP



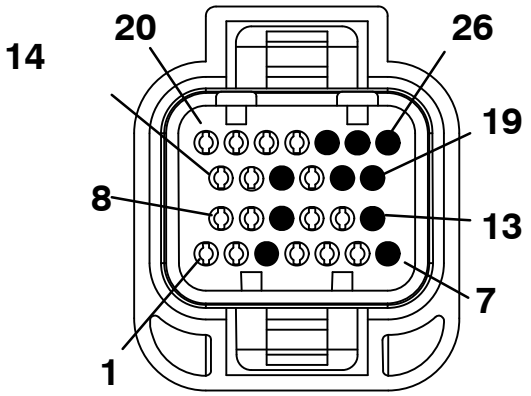
Component	Connector	Terminal
DISP-1 (BLK)	A	1
DISP-2 (WHT)	B	2
DISP-3 (RED)	C	3
DISP-4 (GRN)	D	4
DISP-5 (BRN)	E	5
DISP-7 (BLU)	F	6
DISP-6 (ORN)	G	7
DISP-8 (YEL)	H	8
Unused terminals: None		

DP16



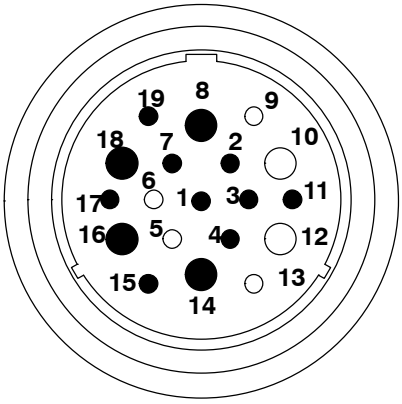
Component	Terminal
1DTT	A
1DTT	B
1SAT	C
1SAT	D
EVOT	E
EVOT	F
1RAT	G
1RAT	H
EVXV-A	J
EVXV-B	K
EVXV-C	L
EVXV-D	M
EVXV-E	N
EVOP-1	P
EVOP-2	R
EVOP-3	S
Unused terminals: None	

ENSCU



Component	Terminal
2MP-18	3
FSA-1	7
ESSN-S	10
SP3	13
MPQC3 (HC-2)	16
STARTER MOTOR	18
SP6 (GND)	19
SP5	24
ENSSN-3	25
FSA-2	26
Unused Terminals: 1, 2, 4, 5, 6, 8, 9, 11, 12, 14, 15, 17, 20,21, 22, 23	

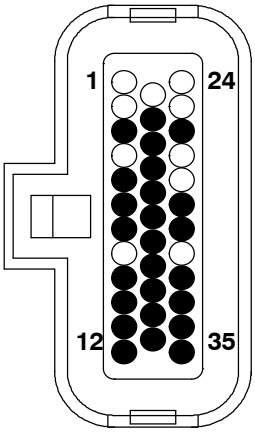
HC Plug



Component	Terminal
OGF-OV/1MP15	1
MPQC-3/ENSCU-16	2
MPQC-1/BTY+	3
MPQC4/SP3	4
SP52/J1-A	7
SSR-87/SS	8
SP60/CCON-IPC	11
IAHR-87/IAH	14
SP57/GND-1	15
FHR-5/FHTS	16
DOES-1/J1-B	17
SP52/SP5	18
SP61/2MP26	19
Unused terminals: 5, 6, 10,12 & 13	

10.2 HARNESS PLUG WIRING FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN-OFF

1MP - NATURAL

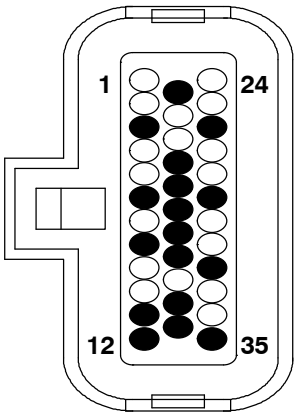


Component	Terminal
REMSN1 (REMSN-E)	3 (14)
REMSN2 (REMSN-H)	4 (14)
CDP-C	5 (16) (30)
EVOP-C (DP16-S)	6 (17) (30)
ENCT	7 (18)
CDT	9 (20)
CST	10 (19)
AAT	11 (22)
1RAT (DP16-G)	12 (23)
REMSN1 (REMSN-F) (SP1)	14 (3)
REMSN2 (REMSN-G) (SP1)	14 (33)
REMSN3 (REMSN-K) (SP1)	14 (33)

1MP - NATURAL (Continued)

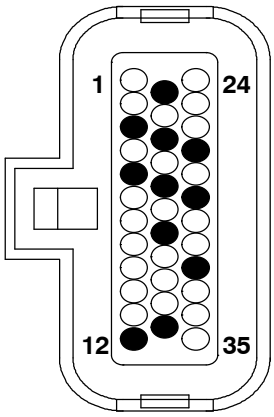
Component	Terminal
CSP-A (SP16)	15 (29) (30)
OGF-OV (HC-1) (SP16)	15
CDP-A	16 (5) (30)
EVOP-A (DP16-P)	17 (6) (30)
ENCT	18 (7)
CST (SP14)	19 (10)
EVOT (DP16-F) (SP14)	19 (32)
CDT	20 (9)
DTT (DP16-B)	21 (34)
AAT	22 (11)
1SAT (DP16-D) (SP12)	23 (35)
1RAT (DP16-H) (SP12)	23
FLS-C	26
CSP-C	29 (15) (30)
CSP-B (SP7)	30 (15) (29)
CDP-B (SP7)	30 (5) (16)
EVOP-B (SP7) (DP16-R)	30 (6) (17)
EVOT (DP16-E)	32 (19)
REMSN3 (REMSN-J)	33 (14)
2RAT (2EVC-J)	33 (23)
DTT (DP16-A)	34 (21)
1SAT (DP16-C)	35 (23)
Unused terminals: 1, 2,8,13,21, 24, 25, 27,28,31	

2 MP - Black



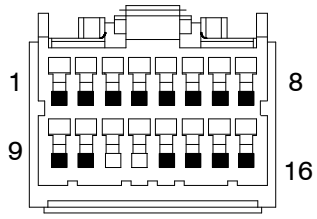
Component	Terminal
OC-C	3
DAS	6
CSMV-D	8 (19) (20) (32)
EVXV-B (DP16-K)	11 (12) (22) (23) (35)
EVXV-E (DP16-N)	12 (11) (22) (23) (35)
REMSN-D	13
REMSN-C	16
ENOPS	17
ENSCU-3	18
CSMV-C	19 (8) (20) (32)
CSMV-A	20 (8) (19) (32)
EVXV-D (DP16-M)	22 (11) (12) (23) (35)
EVXV-A (DP16-J)	23 (11) (12) (22) (35)
HC19 (SP61)	26
SP15	29
CSMV-B	32 (8) (19) (20)
EVXV-C (DP16-L)	35 (11) (12) (22) (23)
Unused terminals: 1,2,4,5,7,9,10,14,15,21,24,25,27, 28,30, 31, 33, 34	

3 MP - Grey



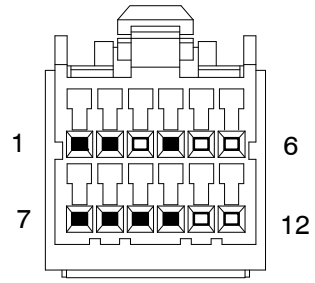
Component	Terminal
SATCOM-C (GND)	3 (15) (27)
SLP-C (GND)	5 (13)(17) (29)
UL1	12
SLP-E	13 (5) (17) (29)
SATCOM-B (RX)	15 (3) (27)
SLP-A (RX)	17 (5) (13) (29)
LB-H (AMBER)	19 (32)
UL2	23
SATCOM-A (TX)	27 (3) (15)
SLP-B (TX)	29 (5) (13) (17)
LB-B (GREEN)	32 (19)
Unused terminals: 1, 2, 4,6, 7, 8, 9, 10, 11, 14, 16,18, 20,21, 22, 24, 25, 26, 28, 30,31, 33,34, 35	

4 MP



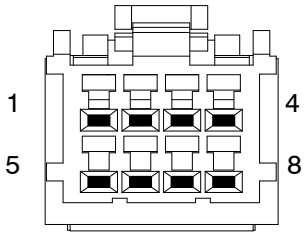
Component	Terminal
CCONR-1 (SP60)	1
CDCON-A2	2
1EVCON-A2	3
SP55 (1HTCON1-A1 & 1HTCON2-A1)	4
CCONR-2	5
CDCON-A1	6
GENCONR-2	7
CT2/OGF (SP54)	8
CT2,3 & 4 BLACK	9
CT3/OGF (SP53)	10
1HTCON1-A1	13
1HTCON2-A1	14
1EVCON-A1	15
FHR-2	16
Unused terminals: 11, 12	

5 MP



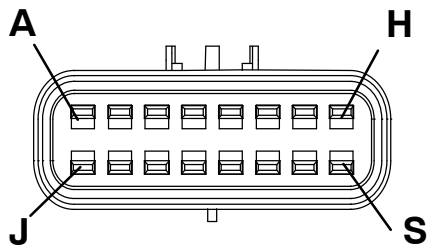
Component	Terminal
MPQCC9/SP52	1
SP56 (DES-B & PRM +12V)	2
PRM-OUT+	4
PSCONR-2	7
BUZZER -	8
GPR-85	9
SSR-85	10
Unused terminals: 3, 5, 6,11, 12	

6 MP



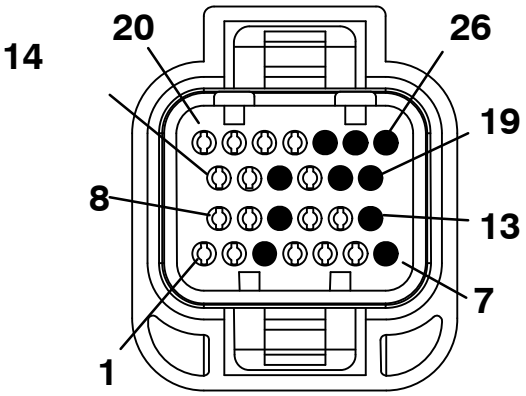
Component	Connector	Terminal
DISP-1 (BLK)	A	1
DISP-2 (WHT)	B	2
DISP-3 (RED)	C	3
DISP-4 (GRN)	D	4
DISP-5 (BRN)	E	5
DISP-7 (BLU)	F	6
DISP-6 (ORN)	G	7
DISP-8 (YEL)	H	8
Unused terminals: None		

DP16



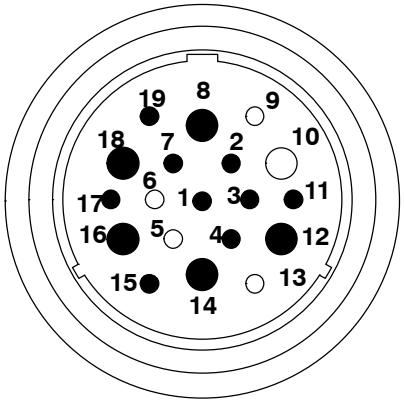
Component	Terminal
1DTT	A
1DTT	B
1SAT	C
1SAT	D
EVOT	E
EVOT	F
1RAT	G
1RAT	H
EVXV-A	J
EVXV-B	K
EVXV-C	L
EVXV-D	M
EVXV-E	N
EVOP-A	P
EVOP-B	R
EVOP-C	S
Unused terminals: None	

ENSCU



Component	Terminal
2MP-18	3
FSA-1	7
ESSN-S	10
SP3	13
HC-2	16
STARTER MOTOR	18
SP6 (GND)	19
SP5	24
ENSSN-12V	25
FSA-2	26
Unused Terminals: 1, 2, 4, 5, 6, 8, 9, 11, 12, 14, 15, 17, 20,21, 22, 23	

HC Plug
(Control Box Side)



Component	Terminal
OGF-OV/1MP15	1
MPQC-3/ENSCU-16	2
MPQC-1/BTY+	3
MPQC4/SP3	4
SP52/OC-B	7
SSR-87/SS	8
SP60/IP-C	11
F5-B/BTY+	12
GPR-87/IAH	14
SP57/SP6	15
SP50/SP43	16
RS-B/SP4	17
SP52/SP5	18
SP61/2MP26	19
Unused terminals: 5, 6,9, 10 & 13	

10.3 CONTROL BOX INTERIOR SPLICE POINTS FOR UNITS WITH A MAIN POWER SWITCH LABELED ENGINE/OFF/STANDBY

Splice Point No.	Component
50	F5-A
	F19-A
	IAHR-30
	F6-A
	SSR-30
	F9-A
52	BUZZER +
	5MP-1
	OGF - +12V
	SSR-86
	HC-18
	MPQC-9
	MPQC-8
	SP59
	HC-7
	SP62
53	CT-BLUE
	4MP-10
	OGF-BLUE
54	CT-BROWN
	4MP-8
	OGF-BROWN
55	4MP-4
	1HTCON1-A2
	1HTCON2-A2
	SP63
56	5MP-2
	PRM - +12V
	DOES-6

Splice Point No.	Component
57	FHR-1
	HC-15
	MPQC-2
	PRM-OV
	CCON-A2
	GENCONR-3
	LOW VOLT GND
58	F9-B
	CCONR-3
	PSCONR-3
59	EVM-4
	EVHTS-A
	SP52
60	4MP-1
	CCONR-1
	HC-11
61	HC-19
	OGF-S+
	GENCONR-1
	PSCONR-1
62	SP52
	SP59
	CDM2-4
63	SP55
	EVHTS-B

10.4 CONTROL BOX INTERIOR SPLICE POINTS FOR UNITS WITH A MAIN POWER SWITCH LABELED START/RUN-OFF

Splice Point No.	Component
50	F5-A
	HC-16
	GPR-30
	F6-A
	SSR-30
	F9-A
52	BUZZER +
	5MP-1
	OGF - +12V
	SSR-86
	HC-18
	MPQC-9
	MPQC-8
	SP59
	DES-A
	HC-7
	SP62
53	CT-BLUE
	4MP-10
	OGF-BLUE
54	CT-BROWN
	4MP-8
	OGF-BROWN
55	4MP-4
	1HTCON1-A2
	1HTCON2-A2
	SP63

Splice Point No.	Component
56	5MP-2
	PRM - +12V
	DES-B
57	HC-15
	MPQC-2
	PRM-OV
	CCON-A2
	GENCONR-3
	LOW VOLT GND
58	F9-B
	CCONR-3
	PSCONR-3
59	EVM-4
	EVHTS-A
	SP62
60	4MP-1
	CCONR-1
	HC-11
61	HC-19
	OGF-S+
	GENCONR-1
	PSCONR-1
62	SP52
	SP59
	CDM2-4
63	SP55
	EVHTS-B

10.5 DISPLAY TEST POINTS

NOTE

Refer to Section 5.6 for microprocessor and display diagnostic procedures

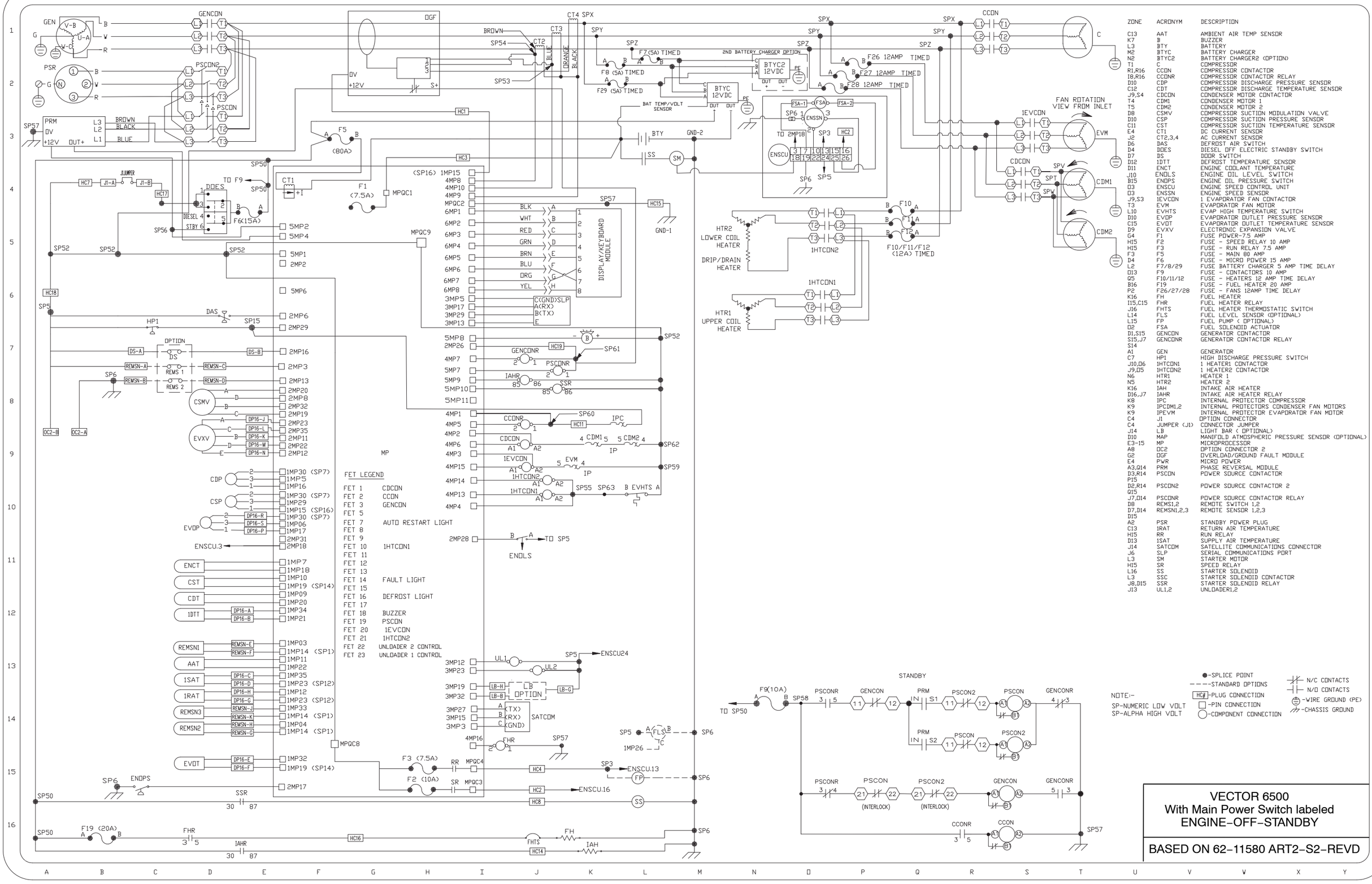
Test Point	Pin	Color	Description
TP14	Pin 1	Black	+12 Vdc for Display backlighting and indicator LED¿s
TP13	Pin 2	White	Ground for Backlighting and indicator LEDs
TP13	Pin 3	Red	Ground for Backlighting and indicator LEDs
TP12	Pin 4	Green	+5 Vdc for Display processor and LCD
TP11	Pin 5	Brown	Display ground
TP10	Pin 6	Orange	TX the serial communications from the control to the display
TP9	Pin 7	Blue	RX the serial communications from the display to the control
TP8	Pin 8	Yellow	Display ground

VOLTAGE TESTS:

Negative Test Lead	Positive Test Lead	Voltage Reading
TP13	TP14	12
TP13	TP12	5
TP13	TP11	0
TP13	TP8	0
TP11	TP14	12
TP11	TP8	0
TP8	TP14	12

10.6 WIRING SCHEMATICS

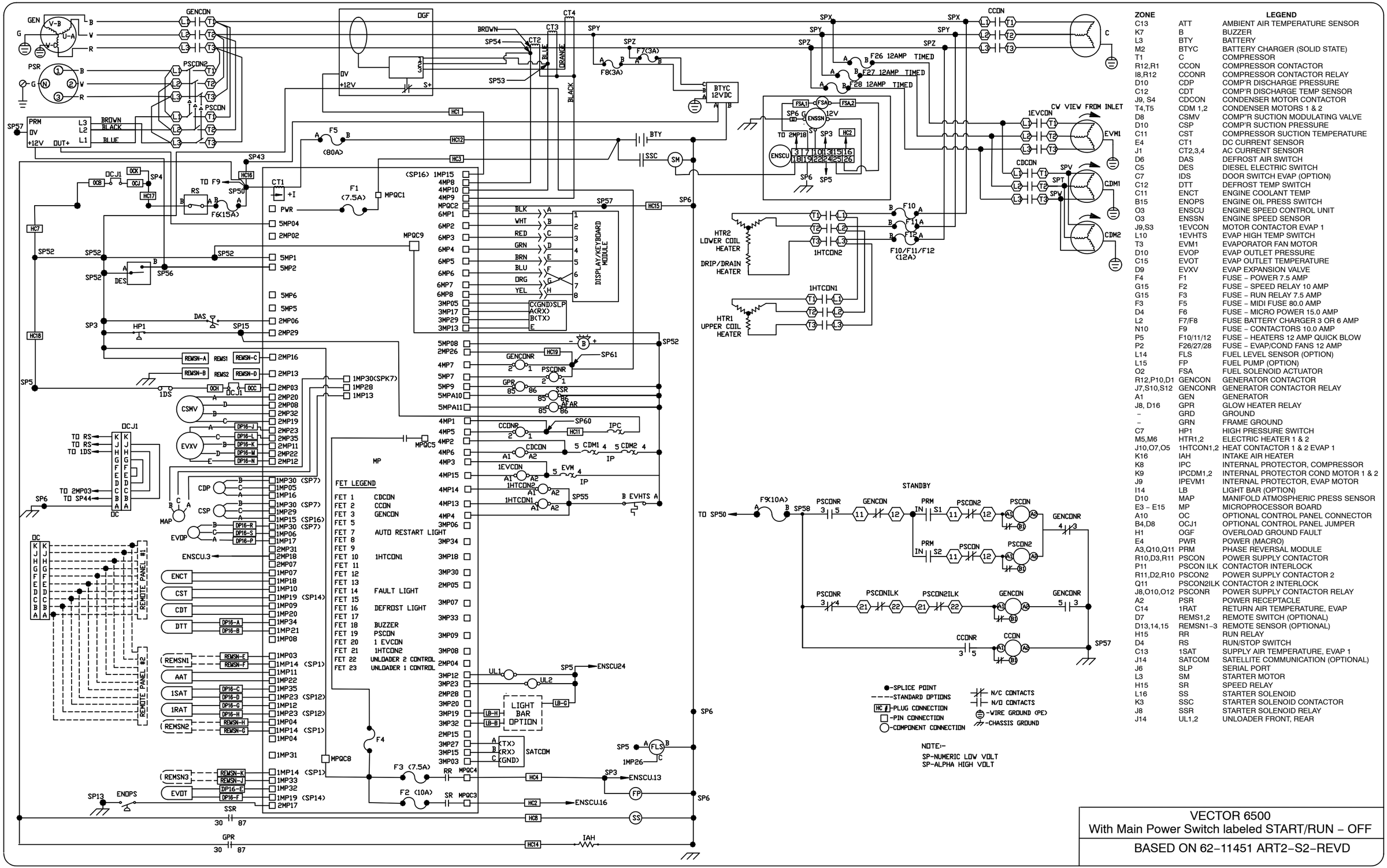
The wiring schematics are provided on the following pages.



ZONE	ACRONYM	DESCRIPTION
C13	AAT	AMBIENT AIR TEMP SENSOR
K7	B	BUZZER
L3	BTY	BATTERY
M2	BTYC	BATTERY CHARGER
N2	BTYC2	BATTERY CHARGER2 (OPTION)
T1	C	COMPRESSOR
R1,R16	CCON	COMPRESSOR CONTACTOR
18,R16	CCONR	COMPRESSOR CONTACTOR RELAY
D10	CDP	COMPRESSOR DISCHARGE PRESSURE SENSOR
C12	CDT	COMPRESSOR DISCHARGE TEMPERATURE SENSOR
J9,S4	CDCON	CONDENSER MOTOR CONTACTOR
T4	CDM1	CONDENSER MOTOR 1
T5	CDM2	CONDENSER MOTOR 2
D8	CSMV	COMPRESSOR SUCTION MODULATION VALVE
D10	CSP	COMPRESSOR SUCTION PRESSURE SENSOR
C11	CST	COMPRESSOR SUCTION TEMPERATURE SENSOR
E4	CT1	DC CURRENT SENSOR
J2	CT2,3,4	AC CURRENT SENSOR
D6	DAS	DEFROST AIR SWITCH
D4	DDES	DIESEL OFF ELECTRIC STANDBY SWITCH
D7	DS	DOOR SWITCH
D12	1DTT	DEFROST TEMPERATURE SENSOR
D11	ENCT	ENGINE COOLANT TEMPERATURE
J10	ENOLS	ENGINE OIL LEVEL SWITCH
B15	ENOPS	ENGINE OIL PRESSURE SWITCH
D3	ENSCU	ENGINE SPEED CONTROL UNIT
D3	ENSSN	ENGINE SPEED SENSOR
J9,S3	1EVCON	1 EVAPORATOR FAN CONTACTOR
T3	EVM	EVAPORATOR FAN MOTOR
L10	EVHTS	EVAP HIGH TEMPERATURE SWITCH
D10	EVDP	EVAPORATOR OUTLET PRESSURE SENSOR
C15	EVOT	EVAPORATOR OUTLET TEMPERATURE SENSOR
D9	EVXV	ELECTRONIC EXPANSION VALVE
G4	F1	FUSE POWER-7.5 AMP
H15	F2	FUSE - SPEED RELAY 10 AMP
H15	F3	FUSE - RUN RELAY 7.5 AMP
F3	F5	FUSE - MAIN 80 AMP
D4	F6	FUSE - MICRO POWER 15 AMP
L2	F7/8/29	FUSE BATTERY CHARGER 5 AMP TIME DELAY
D13	F9	FUSE - CONTACTORS 10 AMP
Q5	F10/11/12	FUSE - HEATERS 12 AMP TIME DELAY
B16	F19	FUSE - FUEL HEATER 20 AMP
P2	F26/27/28	FUSE - FANS 12AMP TIME DELAY
K16	FH	FUEL HEATER
I15,C15	FHR	FUEL HEATER RELAY
J16	FHTS	FUEL HEATER THERMOSTATIC SWITCH
L14	FLS	FUEL LEVEL SENSOR (OPTIONAL)
L15	FP	FUEL PUMP (OPTIONAL)
D2	FSA	FUEL SOLENOID ACTUATOR
D1,S15	GENCON	GENERATOR CONTACTOR
S15,J7	GENCONR	GENERATOR CONTACTOR RELAY
S14		
A1	GEN	GENERATOR
C7	HP1	HIGH DISCHARGE PRESSURE SWITCH
J10,D6	1HTCON1	1 HEATER1 CONTACTOR
J9,D5	1HTCON2	1 HEATER2 CONTACTOR
N6	HTR1	HEATER 1
N5	HTR2	HEATER 2
K16	IAH	INTAKE AIR HEATER
D16,J7	IAHR	INTAKE AIR HEATER RELAY
K8	IPC	INTERNAL PROTECTOR COMPRESSOR
K9	IPCDM1,2	INTERNAL PROTECTORS CONDENSER FAN MOTORS
K9	IPEVM	INTERNAL PROTECTOR EVAPORATOR FAN MOTOR
C4	J1	OPTION CONNECTOR
C4	JUMPER (J1)	CONNECTOR JUMPER
J14	LB	LIGHT BAR (OPTIONAL)
D10	MAP	MANIFOLD ATMOSPHERIC PRESSURE SENSOR (OPTIONAL)
E3-15	MP	MICROPROCESSOR
A8	OC2	OPTION CONNECTOR 2
G2	OGF	OVERLOAD/GROUND FAULT MODULE
E4	PWR	MICRO POWER
A3,Q14	PRM	PHASE REVERSAL MODULE
D3,R14	PSCON	POWER SOURCE CONTACTOR
P15		
D2,R14	PSCON2	POWER SOURCE CONTACTOR 2
Q15		
J7,D14	PSCONR	POWER SOURCE CONTACTOR RELAY
D8	REMS1,2	REMOTE SWITCH 1,2
D7,D14	REMSN1,2,3	REMOTE SENSOR 1,2,3
D15		
A2	PSR	STANDBY POWER PLUG
C13	1RAT	RETURN AIR TEMPERATURE
H15	RR	RUN RELAY
D13	1SAT	SUPPLY AIR TEMPERATURE
J14	SATCOM	SATELLITE COMMUNICATIONS CONNECTOR
J6	SLP	SERIAL COMMUNICATIONS PORT
L3	SM	STARTER MOTOR
H15	SR	SPEED RELAY
L16	SS	STARTER SOLENOID
L3	SSC	STARTER SOLENOID CONTACTOR
J8,D15	SSR	STARTER SOLENOID RELAY
J13	UL1,2	UNLOADER1,2

VECTOR 6500
With Main Power Switch labeled
ENGINE-OFF-STANDBY

BASED ON 62-11580 ART2-S2-REVD



ZONE		LEGEND
C13	ATT	AMBIENT AIR TEMPERATURE SENSOR
K7	B	BUZZER
L3	BTY	BATTERY
M2	BTYC	BATTERY CHARGER (SOLID STATE)
T1	C	COMPRESSOR
R12,R1	CCON	COMPRESSOR CONTACTOR
I8,R12	CCONR	COMPRESSOR CONTACTOR RELAY
D10	CDP	COMP'R DISCHARGE PRESSURE
C12	CDT	COMP'R DISCHARGE TEMP SENSOR
J9, S4	CDCON	CONDENSER MOTOR CONTACTOR
T4,T5	CDM 1,2	CONDENSER MOTORS 1 & 2
D8	CSMV	COMP"R SUCTION MODULATING VALVE
D10	CSP	COMP'R SUCTION PRESSURE
C11	CST	COMPRESSOR SUCTION TEMPERATURE
E4	CT1	DC CURRENT SENSOR
J1	CT2,3,4	AC CURRENT SENSOR
D6	DAS	DEFROST AIR SWITCH
C5	DES	DIESEL ELECTRIC SWITCH
C7	IDS	DOOR SWITCH EVAP (OPTION)
C12	DTT	DEFROST TEMP SWITCH
C11	ENCT	ENGINE COOLANT TEMP
B15	ENOPS	ENGINE OIL PRESS SWITCH
O3	ENSCU	ENGINE SPEED CONTROL UNIT
O3	ENSSN	ENGINE SPEED SENSOR
J9,S3	1EVCON	MOTOR CONTACTOR EVAP 1
L10	1EVHTS	EVAP HIGH TEMP SWITCH
T3	EVM1	EVAPORATOR FAN MOTOR
D10	EVOP	EVAP OUTLET PRESSURE
C15	EVOT	EVAP OUTLET TEMPERATURE
D9	EVXV	EVAP EXPANSION VALVE
F4	F1	FUSE – POWER 7.5 AMP
G15	F2	FUSE – SPEED RELAY 10 AMP
G15	F3	FUSE – RUN RELAY 7.5 AMP
F3	F5	FUSE – MIDI FUSE 80.0 AMP
D4	F6	FUSE – MICRO POWER 15.0 AMP
L2	F7/F8	FUSE BATTERY CHARGER 3 OR 6 AMP
N10	F9	FUSE – CONTACTORS 10.0 AMP
P5	F10/11/12	FUSE – HEATERS 12 AMP QUICK BLOW
P2	F26/27/28	FUSE – EVAP/COND FANS 12 AMP
L14	FLS	FUEL LEVEL SENSOR (OPTION)
L15	FP	FUEL PUMP (OPTION)
O2	FSA	FUEL SOLENOID ACTUATOR
R12,P10,D1	GENCON	GENERATOR CONTACTOR
J7,S10,S12	GENCONR	GENERATOR CONTACTOR RELAY
A1	GEN	GENERATOR
J8, D16	GPR	GLOW HEATER RELAY
–	GRD	GROUND
–	GRN	FRAME GROUND
C7	HP1	HIGH PRESSURE SWITCH
M5,M6	HTR1,2	ELECTRIC HEATER 1 & 2
J10,O7,O5	1HTCON1,2	HEAT CONTACTOR 1 & 2 EVAP 1
K16	IAH	INTAKE AIR HEATER
K8	IPC	INTERNAL PROTECTOR, COMPRESSOR
K9	IPCDM1,2	INTERNAL PROTECTOR COND MOTOR 1 & 2
J9	IPEVM1	INTERNAL PROTECTOR, EVAP MOTOR
I14	LB	LIGHT BAR (OPTION)
D10	MAP	MANIFOLD ATMOSPHERIC PRESS SENSOR
E3 – E15	MP	MICROPROCESSOR BOARD
A10	OC	OPTIONAL CONTROL PANEL CONNECTOR
B4,D8	OCJ1	OPTIONAL CONTROL PANEL JUMPER
H1	OGF	OVERLOAD GROUND FAULT
E4	PWR	POWER (MACRO)
A3,Q10,Q11	PRM	PHASE REVERSAL MODULE
R10,D3,R11	PSCON	POWER SUPPLY CONTACTOR
P11	PSCON ILK	CONTACTOR INTERLOCK
R11,D2,R10	PSCON2	POWER SUPPLY CONTACTOR 2
Q11	PSCON2ILK	CONTACTOR 2 INTERLOCK
J8,O10,O12	PSCONR	POWER SUPPLY CONTACTOR RELAY
A2	PSR	POWER RECEPTACLE
C14	1RAT	RETURN AIR TEMPERATURE, EVAP
D7	REMS1,2	REMOTE SWITCH (OPTIONAL)
D13,14,15	REMSN1–3	REMOTE SENSOR (OPTIONAL)
H15	RR	RUN RELAY
D4	RS	RUN/STOP SWITCH
C13	1SAT	SUPPLY AIR TEMPERATURE, EVAP 1
J14	SATCOM	SATELLITE COMMUNICATION (OPTIONAL)
J6	SLP	SERIAL PORT
L3	SM	STARTER MOTOR
H15	SR	SPEED RELAY
L16	SS	STARTER SOLENOID
K3	SSC	STARTER SOLENOID CONTACTOR
J8	SSR	STARTER SOLENOID RELAY
J14	UL1,2	UNLOADER FRONT, REAR

VECTOR 6500
With Main Power Switch labeled START/RUN – OFF

BASED ON 62-11451 ART2-S2-REVD

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